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**Environmental Research Papers**  
**No. 38**



**Ozone-sonde Observations Over North America**  
**Volume 2**

Edited by  
**WAYNE S. HERING**  
**THOMAS R. BORDEN, Jr.**

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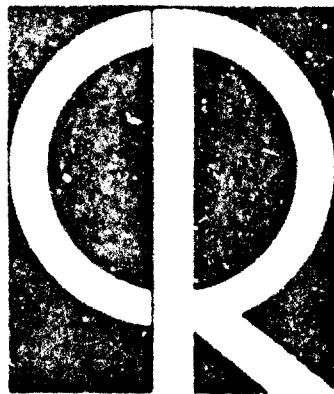
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**Environmental Research Papers  
No. 38**



**Ozonesonde Observations Over North America  
Volume 2**

Edited by  
**WAYNE S. HERING  
THOMAS R. BORDEN, Jr.**

**METEOROLOGY LABORATORY PROJECT 8631**

**AIR FORCE CAMBRIDGE RESEARCH LABORATORIES, OFFICE OF AEROSPACE RESEARCH, UNITED STATES AIR FORCE, L.G. HANSCOM FIELD, MA 01914**

## **Abstract**

An experimental program for the measurement of the vertical ozone distribution was initiated by the Air Force Cambridge Research Laboratories in January 1963. A network of eleven ozonesonde stations was established in North America to provide high resolution observations of the vertical ozone distribution for a variety of research purposes.

The resultant data are being published in a series of reports. The first volume contained the ozonesonde and associated radiosonde observations for the months of December 1962 through March 1963. This second volume contains the ozonesonde and associated radiosonde observations for the months of April through August 1963.

Also included in Volume 2 are the average distributions of ozone over the North American continent as derived from the network observations. Data averages for overlapping bimonthly periods are presented for January-February through July-August 1963.

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# **Ozonesonde Observations Over North America**

## **1. INTRODUCTION**

A systematic observational program designed to extend our knowledge of the structure and behavior of the vertical ozone distribution was initiated in January 1963 by the Air Force Cambridge Research Laboratories. A network of eleven ozonesonde stations has been established with the cooperation of the Air Weather Service, the Canadian Meteorological Branch, and five universities in the United States. The participating stations are listed in Table 1 and shown on the locator chart in Figure 1.

The 1963 schedule of balloon-borne ozonesonde observations comprises ascents each Wednesday at all network stations. The ozonesonde observation, which includes companion measurements of temperature, pressure, and humidity, is substituted for the conventional radiosonde ascent at those network stations which are a part of the radiosonde network. In addition to the regular Wednesday observations, a special synoptic series of daily launches at 1200Z at all stations was scheduled for the period 29 April to 10 May 1963. The published data also include a few unscheduled ascents made in situations of special meteorological interest.

TABLE 1. Ozonesonde network

Station	Lat. (Deg. N)	Long. (Deg. W)
Albrook Fld, Canal Zone (AWS)	9.0	79.6
Colorado State University, Fort Collins	40.5	105.1
Eielson AFB, Fairbanks, Alaska (AWS)	64.8	147.9
Florida State University, Tallahassee	30.4	84.3
Fort Churchill, Manitoba (Canadian Met. Br.)	58.8	94.1
Goose Bay, Labrador (Canadian Met. Br.)	53.3	60.4
L. G. Hanscom Fld., Bedford, Mass.	42.5	71.3
Thule AFB, Greenland (AWS)	76.5	68.8
University of New Mexico, Albuquerque	35.0	106.6
University of Washington, Seattle	47.4	122.3
University of Wisconsin, Madison	43.1	89.4



Figure 1. AFCRL Ozonesonde Network

## 2. INSTRUMENTATION

The ozone observations were obtained by the use of the chemiluminescent-type ozonesonde developed by V. Regener (1960). The dry chemical instrument measures the light energy released as a result of the luminescent reaction of ozone with a silica-gel disc treated with an organic dye, Rhodamin B. The photon yield of the disc, which is proportional to the ozone concentration, is detected by means of a photomultiplier tube. The current output of the photomultiplier is amplified, fed into the transmitter circuit of the radiosonde, and the ozone signal is telemetered to a ground-based receiver along with the conventional radiosonde data. The ozone signal interrupts the normal sequence of radiosonde data to provide measurements of ozone, ozone reference, and instrument temperature of a few seconds duration every 15 seconds. The 1200-gram sounding balloon used in the program has an average rate of rise of  $1000 \text{ ft min}^{-1}$  which results in ozone measurements at approximately 250-ft intervals in the vertical.

The standard ozone source of the ultraviolet type is used in the field to precondition the sonde, to adjust the sensitivity, and to calibrate the instrument. Ozone is produced by irradiation of an oxygen-air stream by a quartz mercury lamp. The ozone source strength depends on many factors including the intensity of the lamp in the ultraviolet, the rate of oxygen and air flow, the temperature and pressure of the gas stream, and the amount of ozone destruction within the generator and tubing. In practice it has been difficult to achieve stability of all the factors required for precise calibration of the ozonesonde. We therefore must rely on available observations of the total ozone amount obtained with the Dobson spectrophotometer for absolute calibration. Such measurements are made daily at a number of stations throughout the network area by the United States Weather Bureau and the Meteorological Office of Canada. The ozone concentration at all levels for a particular sounding is corrected by a single factor given by the ratio of the spectrophotometer measurement to the integrated amount measured by the sonde plus a residual amount estimated by assuming the ozone mixing ratio is constant from the top of the sounding to the top of the atmosphere. Published data include only those soundings reaching an altitude considered sufficient for a reliable estimate of the residual amount.

The exact nature of the reactions involved in the chemiluminescent method of ozone measurement remains obscure. Confidence in the accuracy and utility of the sonde was realized only after extensive laboratory and field tests conducted by the University of New Mexico, Parametrics, Inc., and the Air Force Cambridge Research Laboratories. An estimate of the relative accuracy of the Regener sonde may be obtained by reference to a series of performance tests of production



models carried out at Bedford, Massachusetts, in December 1962 just prior to the start of the network program. A total of 15 ascents were made over a test period of 13 days. The series included six pairs of observations with an average interval between release times of less than two hours. The resultant data were presented as the first of the series of soundings published in Volume 1. It is difficult to estimate the combined effect of all sources of error inherent in the ozone observations. Hence, this presentation of data from the experimental ozonesonde network is considered provisional and reference to this fact should be made if the data are used in published research papers.

### 3. OZONESONDE DATA

This second volume in the ozonesonde network series contains data of the individual ascents obtained during the time interval April 1963 through August 1963. It also includes the special synoptic series of observations scheduled for the period 29 April to 10 May. The ascents are arranged in chronological order and in order of increasing latitude on a given observational day. The release times are designated on the charts in Greenwich Meridian Time. A summary of these ascents is given in Table 2.

Individual data points were extracted from the flight records at half-minute intervals, corresponding to approximately 500-ft intervals in the vertical. The complete data listings for the ascents presented in this volume may be obtained in punch card or tabulated form from the Data Processing Division, Climatic Center, USAF, Federal Building, Asheville, North Carolina. A sample tabulation is given in Table 17.

TABLE 2. Summary of observations (volume 2)

Date		Stations
April	3	Canal Zone, Albuquerque, Fort Collins, Bedford, Fort Churchill, Fairbanks, Thule
	4	Madison
	10	Tallahassee, Albuquerque, Bedford
	17	Canal Zone, Albuquerque, Fort Collins, Seattle, Goose Bay
	24	Tallahassee, Albuquerque, Fort Collins, Bedford (2), Goose Bay, Fort Churchill, Fairbanks
	29	Albuquerque, Fort Collins, Bedford (2), Madison, Seattle, Goose Bay, Fort Churchill, Fairbanks
	30	Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Madison, Seattle, Goose Bay, Fairbanks
May	1	Canal Zone, Albuquerque, Fort Collins, Bedford, Seattle, Goose Bay, Fort Churchill, Thule
	2	Albuquerque, Fort Collins, Bedford, Seattle, Goose Bay, Fort Churchill, Fairbanks
	3	Albuquerque, Fort Collins, Bedford, Seattle, Goose Bay, Fort Churchill, Fairbanks, Thule
	4	Canal Zone, Tallahassee (2), Albuquerque, Fort Collins, Bedford, Seattle, Fort Churchill
	5	Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Goose Bay
	6	Tallahassee, Albuquerque, Fort Collins, Bedford, Madison, Seattle, Fort Churchill
	7	Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Goose Bay, Fort Churchill, Thule
	8	Canal Zone, Tallahassee, Albuquerque, Bedford, Seattle, Goose Bay, Fort Churchill, Fairbanks (2), Thule
	9	Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Goose Bay, Fort Churchill, Thule
	10	Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Fort Churchill, Thule
	15	Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Fort Churchill, Thule
	16	Fairbanks
	22	Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Madison, Seattle, Fort Churchill, Fairbanks, Thule
	29	Canal Zone, Albuquerque, Bedford, Seattle, Fort Churchill, Thule
	30	Goose Bay
June	5	Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Fort Churchill, Fairbanks
	10	Goose Bay
	12	Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Goose Bay, Fort Churchill, Thule
	18	Fairbanks
	19	Albuquerque, Fort Collins, Bedford, Goose Bay, Fort Churchill
	23	Albuquerque, Fort Collins (2), Bedford, Seattle, Fort Churchill, Fairbanks, Thule

TABLE 2. Summary of observations (volume 2) (continued)

Date	Stations
July	3 Canal Zone, Albuquerque, Fort Collins (2), Bedford, Madison, Seattle, Fort Churchill 9 Thule 10 Canal Zone, Albuquerque, Bedford, Madison, Seattle, Fort Churchill 17 Albuquerque, Bedford, Seattle, Goose Bay, Fort Churchill, Thule 19 Fairbanks 20 Tallahassee 23 Fort Collins 24 Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Fort Churchill, Fairbanks, Thule 25 Goose Bay 30 Fort Collins (2) 31 Albuquerque, Fort Collins (2), Fort Churchill, Thule
August	7 Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Fort Churchill, Thule 14 Canal Zone, Tallahassee, Albuquerque, Fort Collins, Bedford, Seattle, Goose Bay, Fort Churchill, Thule 15 Fairbanks 21 Tallahassee, Albuquerque, Fort Collins, Seattle, Goose Bay, Fort Churchill, Fairbanks, Thule 28 Tallahassee, Albuquerque, Fort Collins, Seattle, Fort Churchill 29 Fairbanks

#### 4. AVERAGE OZONE DISTRIBUTION

The ozonesonde measurements for the initial months of the AFCRL network program were used to estimate average distributions over the North American continent. Mean latitude-altitude cross sections were constructed for overlapping bimonthly periods from January to August 1963.

The ozonesonde data were summed and averaged to yield mean bimonthly profiles for each station as the first step in the time and space averaging process. Individual ascents included in the averages were separated by a time interval of at least 2 days to reduce the effects of persistence. The resultant station values were plotted and analyzed to determine the horizontal distribution over the network area for each 2-km stratum up to 30 km for each bimonthly period. Interpolated grid point values were then averaged for the zone 60°W to 120°W to yield mean north-south cross sections for the region of North America. The average values of ozone density and ozone mixing ratio for the 7 bimonthly intervals are given in Tables 3 to 16.

Due to the many uncertainties involved in the synthesis, the cross sections provide only rough general estimates of the ozone distribution as observed during the first half of 1963. Although a large number of ozonesonde profiles were available for the analysis, the sample is small in relation to the synoptic-scale variability in the ozone distribution. Furthermore, the averages over the continent mask significant and systematic longitudinal variations. A north-south profile along 80°W in the region of the quasi-permanent trough in the upper troposphere and lower stratosphere would show substantially larger ozone concentrations in the 8- to 20-km stratum than the profile along 120°W in the region of the ridge.

A sample profile for the season of maximum ozone concentration is shown in Figure 2. The ozone density averages near  $50 \mu\text{g m}^{-3}$  throughout the well-mixed troposphere, although slightly higher amounts are observed in middle latitudes. The level of maximum density is observed at 16 km at 70°N and slopes upward with decreasing latitude to near 25 km at the equator. Maximum density in the vertical varies on the average from  $700 \mu\text{g m}^{-3}$  in the polar region to about half that value at low latitudes.

The ozone density configuration of the summer cross section shown in Figure 3 is similar to the spring distribution, but the horizontal and vertical gradients are greatly reduced at middle and high latitudes. The maximum density at 70°N is approximately  $400 \mu\text{g m}^{-3}$  and is located near 18 km. As shown on the change chart in Figure 4, the summer averages are less than the spring values over most of the stratosphere below 28 km, with a maximum change of greater than  $300 \mu\text{g m}^{-3}$  near 16 km in the polar region.

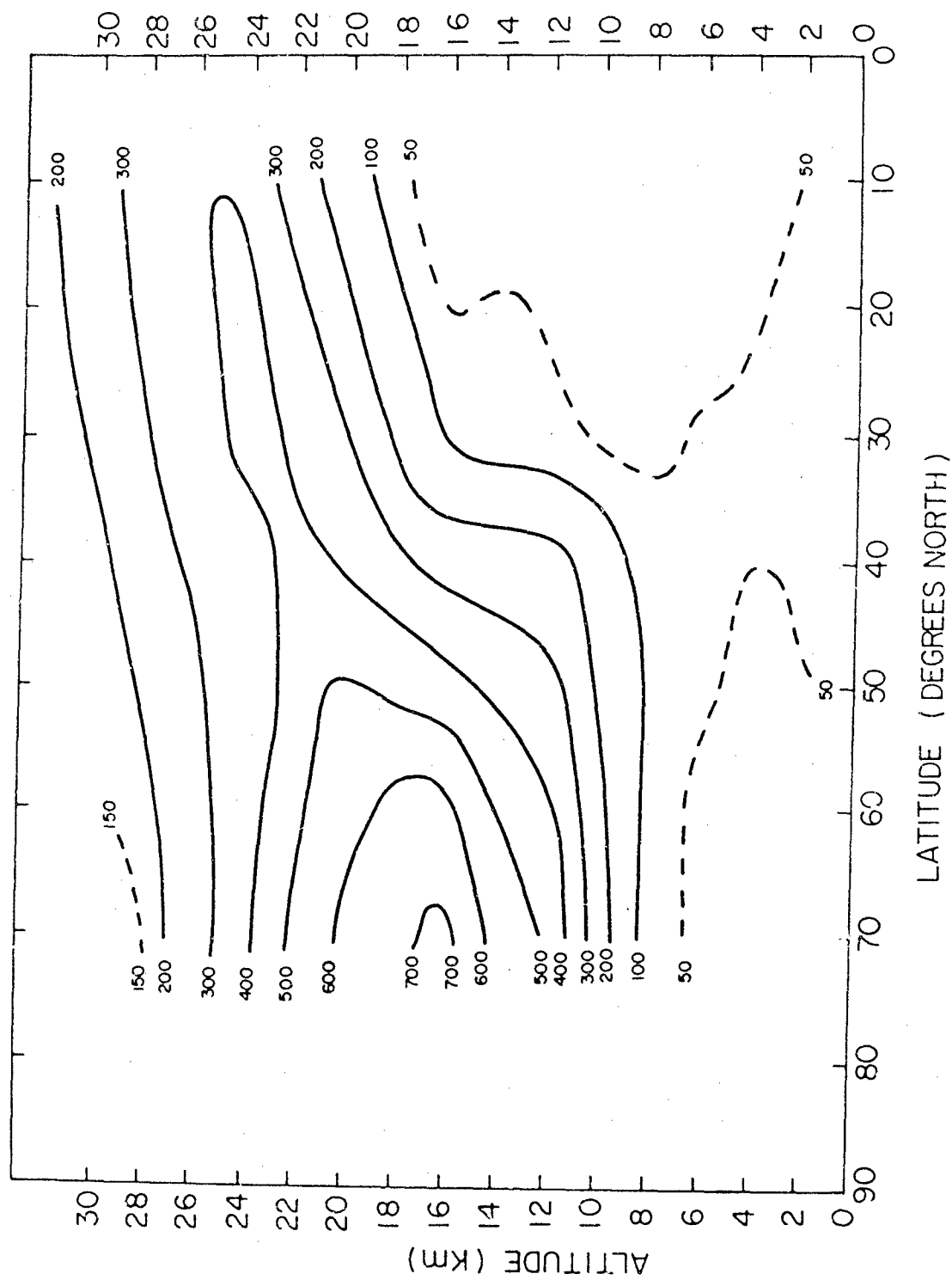


Figure 2. Mean Ozone Density ( $\mu\text{g m}^{-3}$ ) for March-April 1963

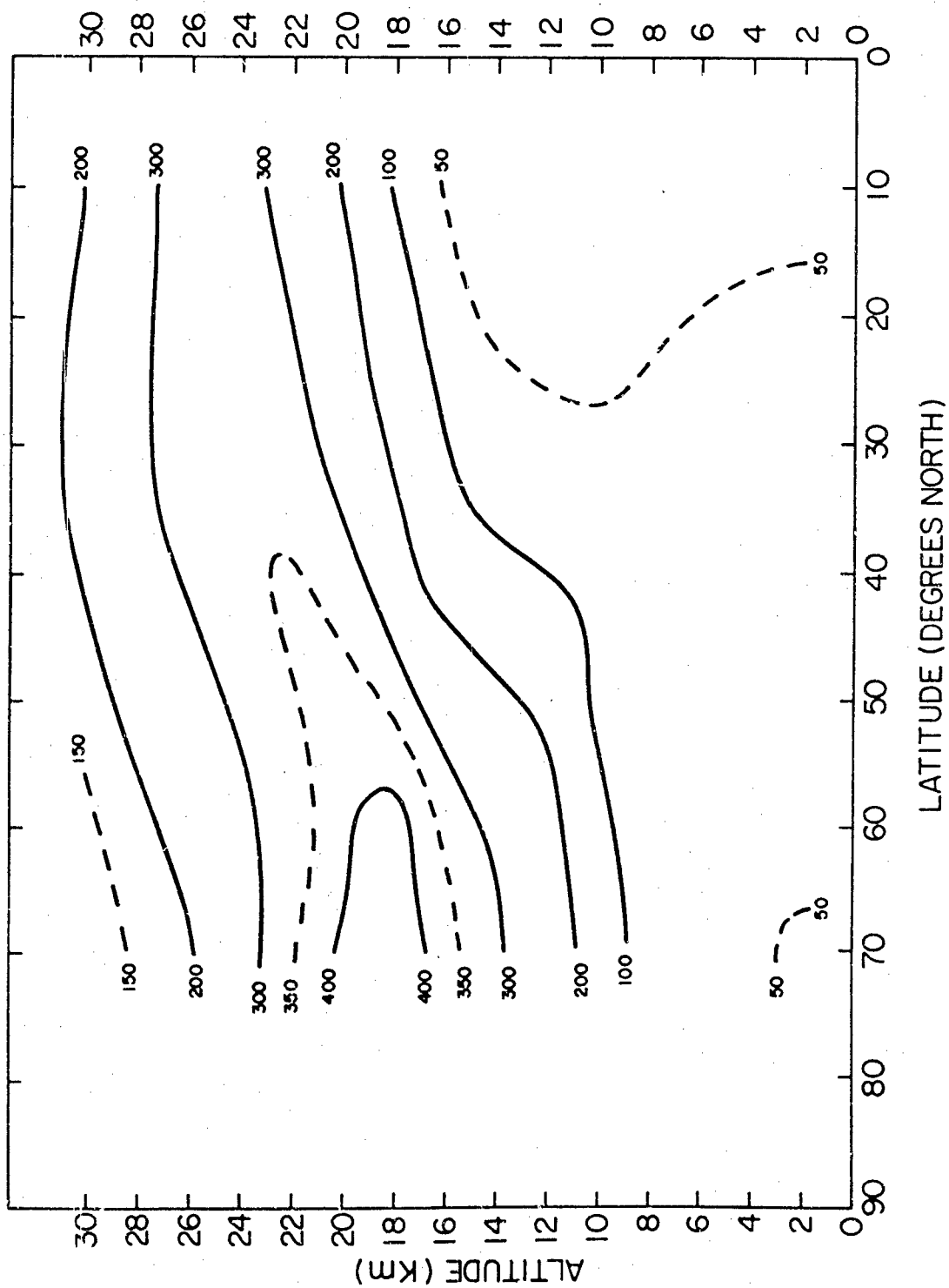


Figure 3. Mean Ozone Density ( $\mu\text{g m}^{-3}$ ) for July-August 1963

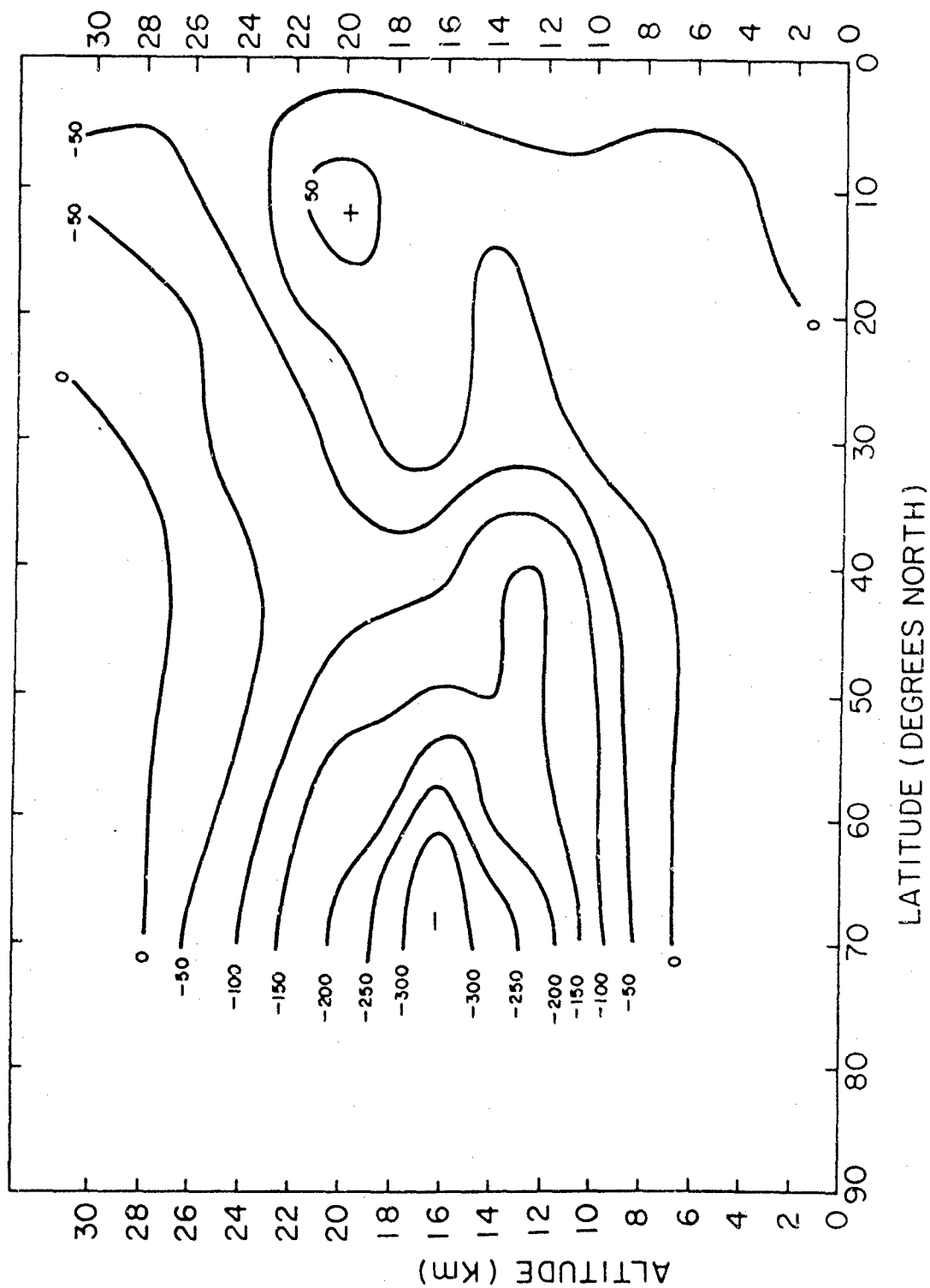


Figure 4. Changes in Mean Ozone Density ( $\mu\text{g m}^{-3}$ ), July-August 1963 Minus March-April 1963

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Figure 5 shows the seasonal changes in ozone density for various altitude levels at 40°N. In the altitude range 10 to 18 km, the ozone density increases to a maximum in the spring and steadily decreases to a minimum in the autumn. The month of maximum ozone density advances with increasing altitude. A gradual decrease from January-February to July-August is observed at 22 and 26 km. At 30 km the seasonal variation is small with a maximum in ozone density in the summer months.

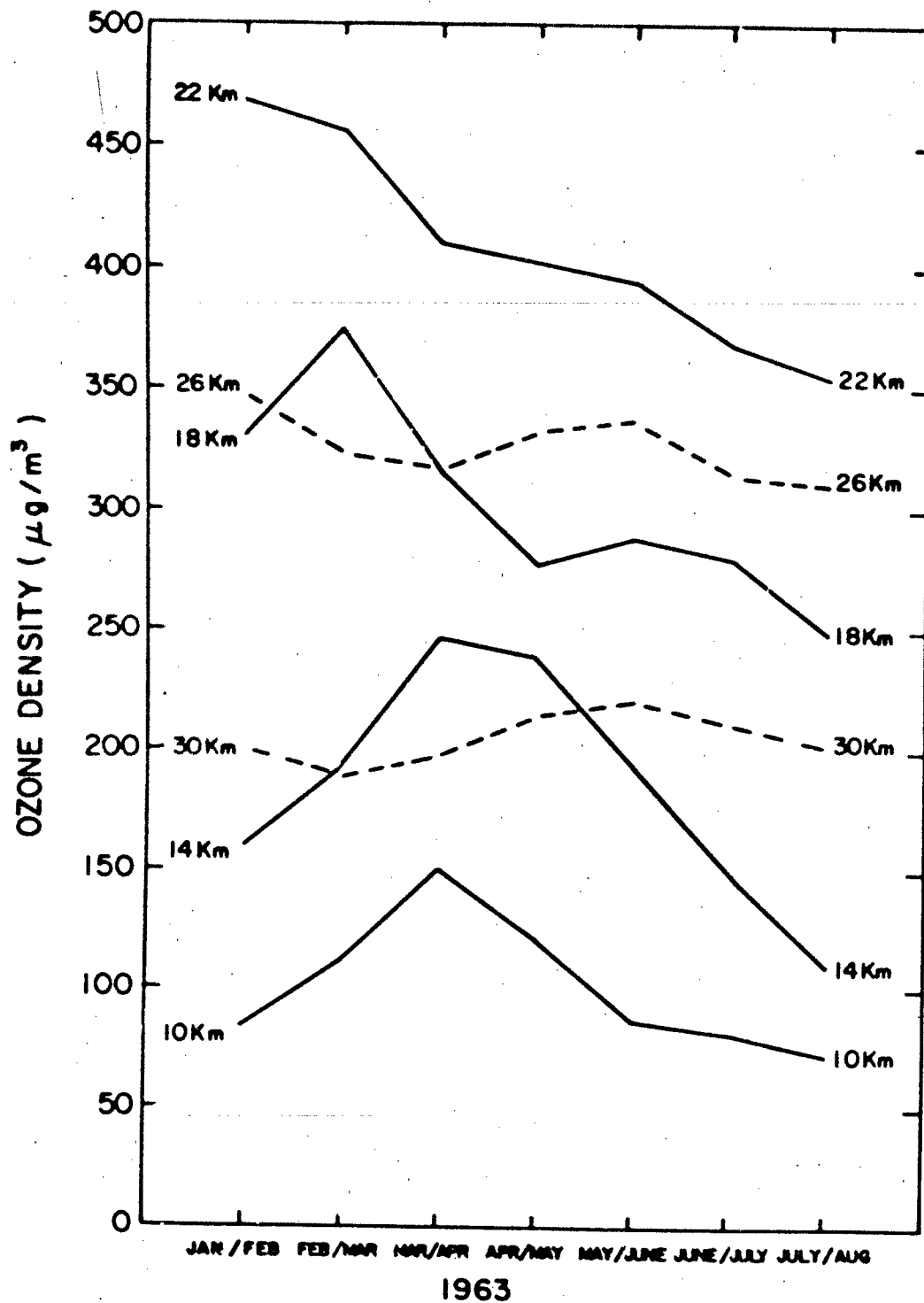


Figure 5. Seasonal Changes in Mean Ozone Density at 40°N

TABLE 3. Bimonthly mean ozone density ( $\mu\text{g}/\text{m}^3$ )\* for  
January/February 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	-	-	-	200	224	240	248
28	147	185	227	278	305	327	341
26	220	255	295	348	394	423	418
24	347	392	405	420	446	434	400
22	431	477	498	468	431	377	310
20	505	518	497	445	352	277	190
18	576	568	468	330	186	118	58
16	546	546	373	203	94	59	26
14	504	444	302	160	46	28	21
12	330	314	235	128	54	33	21
10	237	225	156	84	39	28	20
8	87	93	77	55	30	25	29
6	32	33	40	43	31	27	30
4	32	32	39	41	33	29	26
2	39	38	40	42	35	31	27

\*To convert to units of m atm-cm/km, multiply values in Tables 3 through 9 by 0.0467.

TABLE 4. Bimonthly mean ozone density ( $\mu\text{g}/\text{m}^3$ ) for  
February/March 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	-	-	-	189	219	250	279
28	150	176	212	261	298	325	343
26	245	256	278	324	387	412	407
24	338	358	379	404	443	435	394
22	458	489	487	455	423	359	277
20	526	540	516	451	344	254	162
18	588	585	494	375	189	114	58
16	568	536	405	250	96	60	31
14	541	479	327	192	81	49	22
12	402	378	279	164	64	37	23
10	284	270	187	112	39	31	29
8	95	103	89	69	35	27	30
6	38	38	44	50	42	37	32
4	35	37	42	47	45	39	31
2	43	41	40	45	46	44	40

TABLE 5. Bimonthly mean ozone density ( $\mu\text{g}/\text{m}^3$ ) for  
March/April 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	-	-	-	198	212	241	262
28	149	172	207	248	298	331	348
26	248	256	281	317	371	389	398
24	368	341	350	375	423	405	356
22	504	472	430	410	384	302	239
20	613	570	504	389	315	228	146
18	662	619	480	317	168	107	57
16	723	632	424	234	82	47	21
14	565	479	369	247	90	55	23
12	500	422	339	255	69	41	29
10	272	218	191	150	37	28	29
8	96	80	78	71	44	35	28
6	41	44	53	57	52	47	33
4	44	46	47	50	55	49	38
2	43	46	49	56	61	59	53

TABLE 6. Bimonthly mean ozone density ( $\mu\text{g}/\text{m}^3$ ) for  
April/May 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	141	160	188	214	237	253	265
28	181	198	233	271	311	341	362
26	249	268	301	332	370	396	414
24	327	338	362	383	395	385	370
22	433	424	414	403	383	320	273
20	495	512	476	386	318	250	163
18	584	562	443	277	176	119	58
16	535	522	416	223	96	62	24
14	444	431	389	239	92	56	23
12	441	412	338	212	70	45	30
10	310	263	198	121	38	28	29
8	113	95	79	63	45	36	29
6	60	54	57	56	50	40	29
4	57	55	53	55	64	46	29
2	50	51	56	62	61	49	34

TABLE 7. Bimonthly mean ozone density ( $\mu\text{g}/\text{m}^3$ ) for  
May/June 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	135	158	188	221	239	250	257
28	175	198	238	277	310	338	362
26	236	261	298	337	369	396	413
24	298	318	348	373	386	394	385
22	383	394	402	394	376	334	286
20	452	478	471	383	324	257	164
18	523	512	423	288	180	122	60
16	480	460	373	201	116	72	30
14	418	394	322	193	111	59	23
12	433	402	302	175	76	45	29
10	322	287	203	87	43	30	28
8	131	110	81	57	46	36	30
6	63	58	54	54	53	43	29
4	61	58	55	55	59	48	28
2	51	52	57	65	61	49	30

TABLE 8. Bimonthly mean ozone density ( $\mu\text{g}/\text{m}^3$ ) for  
June/July 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	118	142	178	211	224	214	205
28	154	184	222	264	287	298	305
26	192	233	270	315	354	369	375
24	265	286	312	344	371	367	339
22	330	341	362	368	363	326	281
20	404	429	394	361	326	260	186
18	435	442	388	280	217	162	98
16	398	378	316	179	128	89	51
14	382	346	269	148	88	57	33
12	359	332	275	158	60	41	32
10	225	195	147	82	48	38	31
8	90	80	70	56	48	40	32
6	64	65	58	54	55	47	34
4	61	64	63	61	59	49	31
2	49	53	61	66	56	43	30

TABLE 9. Bimonthly mean ozone density ( $\mu\text{g}/\text{m}^3$ ) for  
July/August 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	114	136	168	202	220	215	203
28	158	183	220	261	290	288	276
26	194	228	265	311	333	341	348
24	268	285	309	336	337	334	325
22	346	327	346	355	322	301	275
20	403	390	367	330	275	238	198
18	444	420	346	248	186	141	98
16	373	343	269	146	100	69	48
14	309	285	224	110	56	41	32
12	265	238	189	103	57	46	34
10	151	110	83	73	54	41	33
8	61	56	60	66	57	47	37
6	59	63	63	62	61	50	38
4	55	64	70	70	67	55	39
2	47	57	68	81	77	61	35

TABLE 10. Bimonthly mean ozone mixing ratio ( $\mu\text{g}/\text{g}$ ) for  
January/February 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	-	-	-	11.43	12.44	13.26	13.63
28	6.14	7.72	9.32	11.39	12.37	13.16	13.69
26	6.72	7.73	8.94	10.31	11.50	12.35	12.20
24	7.83	8.80	9.05	9.08	9.49	9.14	8.42
22	7.18	7.92	8.14	7.35	6.58	5.67	4.59
20	6.25	6.30	5.90	5.09	3.82	2.90	1.99
18	5.26	5.09	4.12	2.75	1.44	0.84	0.41
16	3.65	3.62	2.38	1.23	0.52	0.31	0.13
14	2.49	2.17	1.44	0.72	0.19	0.11	0.08
12	1.21	1.14	0.83	0.43	0.17	0.10	0.06
10	0.63	0.59	0.49	0.21	0.09	0.07	0.05
8	0.17	0.18	0.15	0.11	0.06	0.05	0.06
6	0.05	0.05	0.06	0.07	0.05	0.04	0.05
4	0.04	0.04	0.05	0.05	0.04	0.04	0.03
2	0.04	0.04	0.04	0.04	0.03	0.03	0.03

TABLE 11. Bimonthly mean ozone mixing ratio ( $\mu\text{g/g}$ ) for February/March 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	-	-	-	10.47	12.13	13.81	15.33
28	6.15	7.13	8.58	10.55	12.02	13.08	13.80
26	7.45	7.76	8.42	9.56	11.42	12.12	11.97
24	7.50	7.95	8.38	8.78	9.43	9.21	8.34
22	7.58	8.00	7.83	7.15	6.43	5.39	4.15
20	6.49	6.55	6.11	5.15	3.78	2.67	1.69
18	5.35	5.25	4.33	3.14	1.47	0.81	0.41
16	3.81	3.57	2.58	1.53	0.54	0.31	0.16
14	2.70	2.35	1.56	0.87	0.34	0.19	0.08
12	1.48	1.37	0.98	0.55	0.20	0.11	0.07
10	0.77	0.71	0.47	0.27	0.09	0.07	0.07
8	0.19	0.20	0.17	0.13	0.07	0.05	0.06
6	0.06	0.06	0.07	0.08	0.06	0.06	0.05
4	0.04	0.04	0.05	0.06	0.06	0.05	0.04
2	0.04	0.04	0.04	0.04	0.05	0.04	0.04

TABLE 12. Bimonthly mean ozone mixing ratio ( $\mu\text{g/g}$ ) for March/April 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	-	-	-	10.85	11.58	13.21	14.36
28	6.12	6.95	8.33	9.98	11.94	13.29	13.98
26	7.43	7.64	8.39	9.35	10.78	11.44	11.71
24	8.09	7.49	7.61	8.06	9.00	8.62	7.57
22	8.21	7.56	6.80	6.41	5.80	4.56	3.58
20	7.48	6.81	5.89	4.42	3.44	2.41	1.52
18	5.94	5.50	4.14	2.62	1.30	0.77	0.40
16	4.82	4.15	2.69	1.41	0.46	0.24	0.11
14	2.81	2.32	1.73	1.10	0.37	0.21	0.09
12	1.83	1.51	1.16	0.82	0.21	0.12	0.09
10	0.74	0.56	0.48	0.36	0.09	0.07	0.07
8	0.19	0.15	0.15	0.13	0.08	0.07	0.05
6	0.06	0.07	0.08	0.09	0.08	0.07	0.05
4	0.05	0.05	0.06	0.06	0.07	0.06	0.05
2	0.04	0.04	0.05	0.05	0.06	0.06	0.06

TABLE 13. Bimonthly mean ozone mixing ratio ( $\mu\text{g/g}$ ) for April/May 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	7.52	8.47	9.97	11.47	12.71	13.60	14.44
28	7.15	7.80	9.16	10.69	12.24	13.56	14.48
26	7.22	7.77	8.72	9.62	10.57	11.48	12.18
24	6.96	7.19	7.62	8.06	8.32	8.11	7.79
22	6.87	6.62	6.37	6.15	5.76	4.81	4.07
20	5.86	5.97	5.41	4.29	3.42	2.63	1.71
18	5.12	4.84	3.68	2.22	1.34	0.86	0.41
16	3.47	3.32	2.55	1.30	0.53	0.32	0.12
14	2.15	2.03	1.76	1.02	0.37	0.22	0.09
12	1.56	1.43	1.11	0.66	0.21	0.14	0.09
10	0.82	0.67	0.49	0.29	0.09	0.07	0.07
8	0.22	0.18	0.15	0.12	0.08	0.07	0.06
6	0.09	0.08	0.09	0.08	0.08	0.06	0.05
4	0.07	0.07	0.06	0.07	0.08	0.03	0.04
2	0.05	0.05	0.06	0.06	0.06	0.05	0.04

TABLE 14. Bimonthly mean ozone mixing ratio ( $\mu\text{g/g}$ ) for May/June 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	6.91	8.12	9.64	11.54	12.58	13.23	13.93
28	6.67	7.57	9.10	10.65	11.97	13.28	14.36
26	6.65	7.33	8.35	9.47	10.39	11.31	11.97
24	6.14	6.56	7.18	7.69	8.00	8.21	8.02
22	5.92	6.02	6.05	5.92	5.61	4.98	4.27
20	5.20	5.43	5.26	4.16	3.43	2.69	1.73
18	4.45	4.28	3.43	2.25	1.35	0.89	0.43
16	3.03	2.87	2.23	1.14	0.62	0.37	0.15
14	1.96	1.82	1.42	0.79	0.44	0.23	0.09
12	1.51	1.36	0.97	0.54	0.23	0.13	0.09
10	0.82	0.72	0.49	0.21	0.10	0.07	0.07
8	0.25	0.21	0.16	0.11	0.09	0.07	0.06
6	0.10	0.09	0.08	0.08	0.08	0.07	0.05
4	0.07	0.07	0.07	0.07	0.07	0.06	0.04
2	0.05	0.05	0.06	0.07	0.06	0.05	0.03



TABLE 15. Bimonthly mean ozone mixing ratio ( $\mu\text{g/g}$ ) for June/July 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	5.93	7.17	9.06	10.85	11.58	11.41	11.08
28	5.68	6.81	8.38	9.91	10.91	11.44	12.01
26	5.26	6.37	7.43	8.61	9.77	10.39	10.64
24	5.38	5.78	6.34	6.98	7.57	7.61	7.06
22	5.00	5.11	5.38	5.44	5.38	4.83	4.19
20	4.59	4.79	4.31	3.86	3.41	2.72	1.97
18	3.64	3.62	3.09	2.14	1.61	1.19	0.72
16	2.47	2.32	1.87	0.99	0.67	0.46	0.26
14	1.77	1.58	1.17	0.59	0.34	0.22	0.13
12	1.24	1.12	0.88	0.48	0.18	0.12	0.09
10	0.56	0.49	0.36	0.20	0.11	0.09	0.07
8	0.17	0.15	0.13	0.11	0.09	0.08	0.06
6	0.10	0.10	0.09	0.08	0.08	0.07	0.05
4	0.07	0.08	0.08	0.08	0.07	0.06	0.04
2	0.05	0.05	0.06	0.07	0.06	0.04	0.03

TABLE 16. Bimonthly mean ozone mixing ratio ( $\mu\text{g/g}$ ) for July/August 1963

Km	70°N	60°N	50°N	40°N	30°N	20°N	10°N
30	5.73	6.83	8.57	10.36	11.34	11.50	10.88
28	5.84	5.77	8.27	9.74	10.98	11.10	10.82
26	5.32	6.25	7.33	8.52	9.19	9.61	9.87
24	5.44	5.76	6.28	6.75	6.79	6.85	6.70
22	5.22	4.90	5.14	5.22	4.74	4.43	4.07
20	4.57	4.35	3.99	3.51	2.89	2.50	2.10
18	3.72	3.43	2.75	1.88	1.38	1.04	0.72
16	2.32	2.09	1.58	0.79	0.52	0.36	0.25
14	1.43	1.29	0.97	0.44	0.22	0.16	0.12
12	0.91	0.80	0.61	0.31	0.17	0.14	0.10
10	0.37	0.27	0.20	0.17	0.13	0.10	0.08
8	0.12	0.11	0.12	0.13	0.11	0.09	0.07
6	0.09	0.10	0.10	0.10	0.09	0.08	0.06
4	0.07	0.08	0.09	0.09	0.08	0.07	0.05
2	0.05	0.06	0.07	0.08	0.08	0.06	0.04

TABLE 17. Sample of data listing for an ozonesonde ascent

STATION ALASKA		LAUNCH DATE 51669		LAUNCH ZULU 2448		SONDE NUMBER 51	
SURFACE CONDITIONS		PRESSURE 1006.6 MB		TEMP 287.1 K		HUMIDITY .0	
OZONE CAL		O3 OUTPUT 89.0		R 50.0 P 57.2		ROOM TEMP 289.2 K	
BASELINE CAL		TEMP -21.1 C		REC'DR DIV 37.6		HUMIDITY 65.0	
						REC'DR DIV 46.0	
TIME	ALT	OZONE	OZDEN	TOTOT	PRESS	TEMP	HUMTY
MIN GP	MEY	WICMR	GAMMA	BYMCH	MBAR	DEG K	DEG K
0.5	252	26.5	53.8	.00027	996.6	284.9	30.1
1.0	362	25.9	52.6	.00054	983.5	284.1	32.7
1.5	472	26.5	54.1	.00082	970.5	283.0	34.2
2.0	582	25.2	51.7	.00109	957.7	282.1	37.0
2.5	691	25.2	51.9	.00136	945.1	281.3	38.7
3.0	800	24.6	50.8	.00162	932.7	279.8	41.0
3.5	908	25.2	52.3	.00188	920.4	279.1	44.3
4.0	1016	23.4	48.6	.00213	908.2	277.9	46.8
4.5	1124	25.8	53.9	.00239	896.3	277.1	49.9
5.0	1231	26.5	55.6	.00267	884.5	275.5	53.5
5.5	1375	27.8	58.4	.00305	868.7	274.4	56.5
6.0	1519	24.6	52.1	.00342	853.2	272.9	60.6
6.5	1662	25.3	53.7	.00378	838.1	271.8	64.7
7.0	1804	24.0	51.3	.00413	823.1	270.4	68.0
7.5	1946	25.9	55.6	.00448	808.5	268.8	65.8
8.0	2087	25.3	54.6	.00484	794.1	267.6	64.9
8.5	2227	26.5	57.5	.00521	780.0	266.2	73.4
9.0	2366	24.0	52.4	.00557	766.1	264.6	75.3
9.5	2505	22.7	49.7	.00590	752.4	264.0	78.5
10.0	2643	23.3	51.2	.00623	739.1	263.1	79.4
10.5	2786	22.7	50.0	.00659	724.5	262.4	78.3
11.0	2949	22.7	50.1	.00695	710.2	261.9	77.3
11.5	3101	20.8	46.1	.00729	696.1	260.7	72.2
12.0	3253	22.1	49.1	.00763	682.4	260.0	64.3
12.5	3404	22.7	50.7	.00798	668.9	258.8	64.7
13.0	3555	21.4	48.0	.00833	655.7	258.0	64.3
13.5	3705	23.3	52.2	.00868	642.8	258.2	63.5
14.0	3855	22.7	51.0	.00905	630.1	257.7	57.9
14.5	4005	22.7	51.1	.00941	617.6	256.3	46.4
15.0	4154	22.7	51.2	.00976	605.5	256.2	42.2
15.5	4303	22.7	51.6	.01012	593.5	254.6	38.8
16.0	4452	24.0	54.5	.01049	581.7	254.1	38.9
16.5	4600	23.3	53.3	.01087	570.2	252.9	31.0
17.0	4748	22.1	50.6	.01123	558.9	252.1	25.6
17.5	4895	21.4	49.2	.01157	547.8	251.7	21.8
18.0	5042	22.7	52.2	.01192	537.0	251.0	17.6
18.5	5189	22.7	52.3	.01228	526.3	250.7	15.7
19.0	5335	29.0	67.1	.01269	515.9	249.6	14.5
19.5	5481	33.4	77.4	.01310	505.7	249.2	14.6
20.0	5626	32.3	82.0	.01372	495.7	248.6	37.2
20.5	5785	31.5	73.7	.01430	484.9	248.1	62.7
21.0	5944	28.9	67.6	.01482	474.4	247.5	62.6
21.5	6102	24.5	57.3	.01528	464.1	247.1	63.2
22.0	6260	26.4	61.7	.01573	454.1	247.0	63.6
22.5	6418	29.5	69.3	.01621	444.2	246.3	62.2

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TABLE 17. Sample of data listing for an ozonesonde ascent (continued)

STATION	ALASKA	LAUNCH DATE	51663	LAUNCH	2 JUL 2358	SONDE NUMBER	515				
23.0	6375	27.6	65.2	.01570	434.6	244.9	62.2	239.7	2.6381	316.7	.10
23.5	6731	29.5	69.9	.01720	425.2	243.8	62.2	238.7	2.6286	311.3	.11
24.0	6887	27.0	64.3	.01769	416.0	242.6	62.1	237.5	2.6191	311.7	.10
24.5	7042	25.8	61.7	.01815	407.0	241.1	61.8	236.1	2.6096	311.7	.10
25.0	7196	25.7	61.9	.01859	398.2	240.0	61.5	235.0	2.6001	312.3	.10
25.5	7349	25.1	60.8	.01903	389.5	238.5	60.9	233.5	2.5906	312.3	.10
26.0	7503	24.4	59.4	.01946	381.1	238.0	60.3	232.9	2.5811	313.5	.10
26.5	7653	25.7	62.7	.01989	372.9	237.0	59.4	231.8	2.5716	314.2	.11
27.0	7804	23.2	56.9	.02031	364.8	236.2	58.4	230.9	2.5621	315.1	.10
27.5	7954	20.1	49.4	.02069	356.9	235.1	57.5	229.7	2.5526	315.6	.09
28.0	8104	20.1	49.5	.02104	349.2	234.7	56.8	229.1	2.5431	317.0	.09
28.5	8253	23.3	57.5	.02141	341.6	233.6	55.2	227.8	2.5336	317.5	.11
29.0	8402	23.2	57.7	.02181	334.3	232.7			2.5241	318.3	.11
29.5	8550	21.4	53.4	.02220	327.0	231.6			2.5146	318.7	.10
30.0	8697	25.8	64.7	.02261	320.0	230.3			2.5051	318.9	.13
30.5	8844	29.6	74.3	.02309	312.9	229.7			2.4955	320.1	.15
31.0	8993	30.2	76.0	.02361	306.1	229.4			2.4859	321.8	.16
31.5	9143	30.2	76.3	.02414	299.4	228.5			2.4762	322.5	.16
32.0	9291	26.4	67.0	.02464	292.8	227.8			2.4666	323.5	.14
32.5	9438	25.8	65.5	.02509	286.4	227.2			2.4570	324.7	.14
33.0	9585	26.4	67.5	.02555	280.1	225.9			2.4474	325.0	.15
33.5	9731	24.5	62.9	.02600	274.0	225.1			2.4377	325.9	.14
34.0	9876	23.8	61.6	.02642	268.0	223.6			2.4281	325.8	.14
34.5	10020	23.8	62.1	.02684	262.1	221.6			2.4185	324.8	.15
35.0	10163	25.0	65.6	.02727	256.4	220.5			2.4089	325.3	.16
35.5	10313	18.7	49.3	.02767	250.4	219.6			2.3987	326.1	.12
36.0	10463	21.8	57.8	.02805	244.6	218.4			2.3885	326.6	.14
36.5	10612	19.9	52.8	.02843	239.0	218.4			2.3784	328.8	.13
37.0	10761	24.9	65.9	.02885	233.4	218.8			2.3682	331.5	.17
37.5	10911	23.1	60.9	.02929	228.0	218.8			2.3580	333.8	.16
38.0	11061	19.9	52.7	.02969	222.8	218.8			2.3479	336.0	.14
38.5	11211	23.0	60.9	.03009	217.6	218.8			2.3377	338.3	.17
39.0	11360	25.5	67.5	.03054	212.6	218.6			2.3276	340.3	.19
39.5	11509	29.8	78.7	.03105	207.7	218.8			2.3174	342.9	.23
40.0	11659	37.9	99.9	.03167	202.9	219.4			2.3072	346.1	.31
40.5	11803	63.6	166.9	.03257	198.4	220.1			2.2975	349.5	.53
41.0	11947	88.2	230.9	.03391	194.0	220.5			2.2878	352.3	.75
41.5	12091	101.7	266.2	.03559	189.7	220.7			2.2781	354.8	.88
42.0	12235	111.5	290.9	.03748	185.5	221.4			2.2683	358.3	.99
42.5	12380	122.1	317.4	.03954	181.4	222.1			2.2586	361.7	1.11
43.0	12525	124.7	325.1	.04172	177.3	221.4			2.2489	362.9	1.16
43.5	12670	128.0	334.3	.04395	173.4	221.0			2.2392	364.6	1.22
44.0	12814	126.1	329.6	.04620	169.6	220.8			2.2294	366.7	1.23
44.5	12958	124.1	326.6	.04841	165.8	219.4			2.2197	366.6	1.24
45.0	13102	127.8	334.2	.05064	162.2	220.8			2.2100	371.4	1.30
45.5	13233	125.7	327.7	.05266	158.9	221.4			2.2012	374.4	1.31
46.0	13364	124.4	323.1	.05465	155.7	222.3			2.1924	378.1	1.32
46.5	13496	115.5	298.3	.05657	152.6	223.6			2.1837	382.6	1.25
47.0	13628	102.7	266.5	.05831	149.5	222.6			2.1749	383.1	1.13
47.5	13759	101.8	265.8	.05995	146.5	221.0			2.1661	382.6	1.15
48.0	13890	99.3	258.1	.06155	143.6	222.3			2.1573	387.0	1.14
48.5	14021	97.8	240.6	.06308	140.7	222.8			2.1485	390.1	1.09
49.0	14152	122.6	319.0	.06481	137.9	221.9			2.1397	390.8	1.47
49.5	14283	128.4	332.8	.06681	135.2	222.8			2.1309	394.6	1.57
50.0	14414	127.3	330.6	.06885	132.5	222.3			2.1222	396.0	1.59
50.5	14544	133.3	347.0	.07091	129.8	221.7			2.1134	397.3	1.70

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TABLE 17. Sample of data listing for an ozonesonde ascent (continued)

STATION ALASKA			LAUNCH DATE 51663			LAUNCH ZULU 2358			SONDE NUMBER 515		
51.0	14674	133.1	346.9	.07303	127.2	221.6		2.1047	399.3	1.73	
51.5	14804	127.2	331.2	.07509	124.7	221.7		2.0960	401.9	1.65	
52.0	14936	151.2	395.4	.07729	122.2	220.8		2.0873	402.6	2.05	
52.5	15063	158.4	413.7	.07975	119.8	221.0		2.0786	405.3	2.19	
53.0	15193	139.0	362.8	.08210	117.4	221.2		2.0699	407.9	1.96	
53.5	15323	140.4	366.8	.08432	115.1	221.0		2.0611	409.9	2.02	
54.0	15452	170.2	444.6	.08678	112.8	221.0		2.0524	412.3	2.50	
54.5	15582	171.8	448.4	.08949	110.5	221.2		2.0437	415.0	2.57	
55.0	15712	204.6	522.0	.09244	108.4	221.9		2.0350	418.7	3.06	
55.5	15830	194.3	504.3	.09527	106.4	222.4		2.0271	421.9	3.07	
56.0	15948	199.1	516.9	.09809	104.2	222.4		2.0192	424.1	3.15	
56.5	16066	204.1	529.3	.10098	102.6	222.6		2.0113	426.6	3.29	
57.0	16184	192.4	498.6	.10382	100.8	222.8		2.0034	429.2	3.16	
57.5	16302	196.4	509.1	.10660	98.9	222.8		1.9955	431.4	3.28	
58.0	16420	192.4	497.7	.10939	97.2	223.1		1.9877	434.3	3.27	
58.5	16538	198.6	513.9	.11219	95.4	223.1		1.9798	436.6	3.44	
59.0	16656	197.7	512.0	.11503	93.7	222.9		1.9719	438.5	3.41	
59.5	16774	199.3	517.4	.11788	92.0	222.4		1.9640	439.8	3.58	
60.0	16892	198.4	514.1	.12073	90.4	222.8		1.9561	442.7	3.63	
60.5	17017	198.3	513.5	.12373	88.6	222.9		1.9478	445.5	3.70	
61.0	17142	198.7	514.5	.12674	86.9	222.9		1.9394	448.0	3.78	
61.5	17267	204.6	529.1	.12980	85.3	223.3		1.9311	451.1	3.97	
62.0	17392	202.7	525.0	.13289	83.7	222.9		1.9227	452.9	4.01	
62.5	17517	206.1	533.0	.13599	82.1	223.3		1.9144	456.1	4.16	
63.0	17642	219.2	567.6	.13921	80.5	222.9		1.9061	457.9	4.50	
63.5	17767	216.2	559.9	.14251	79.0	222.9		1.8977	460.4	4.53	
64.0	17892	219.5	568.4	.14582	77.5	222.9		1.8894	463.0	4.69	
64.5	18017	218.0	563.2	.14913	76.0	223.5		1.8810	466.6	4.75	
65.0	18142	208.8	537.8	.15237	74.6	224.1		1.8727	470.6	4.63	
65.5	18268	208.7	537.2	.15555	73.1	224.3		1.8643	473.5	4.72	
66.0	18394	219.9	565.6	.15882	71.7	224.5		1.8559	476.5	5.07	
66.5	18521	221.5	569.3	.16218	70.4	224.6		1.8475	479.5	5.21	
67.0	18647	224.5	578.2	.16558	69.0	224.1		1.8391	481.1	5.38	
67.5	18773	210.9	542.5	.16890	67.7	224.5		1.8308	484.4	5.16	
68.0	18899	183.1	470.9	.17190	66.4	224.5		1.8224	487.1	4.56	
68.5	19026	184.5	473.6	.17470	65.1	224.9		1.8140	490.9	4.69	
69.0	19153	181.8	467.0	.17749	63.9	224.8		1.8056	493.2	4.71	
69.5	19280	187.9	483.3	.18031	62.6	224.5		1.7972	495.2	4.96	
70.0	19406	183.4	471.7	.18314	61.5	224.5		1.7888	498.0	4.94	
70.5	19534	186.0	478.9	.18598	60.3	224.3		1.7804	500.4	5.11	
71.0	19662	185.4	476.8	.18884	59.1	224.5		1.7719	503.6	5.12	
71.5	19790	194.4	500.0	.19177	58.0	224.5		1.7634	506.4	5.55	
72.0	19918	192.9	496.1	.19475	56.8	224.5		1.7549	509.2	5.61	
72.5	20046	179.6	462.6	.19761	55.7	224.1		1.7465	511.3	5.33	
73.0	20174	180.1	464.0	.20038	54.7	224.1		1.7380	514.2	5.45	
73.5	20301	176.9	456.7	.20313	53.6	223.6		1.7295	515.9	5.46	
74.0	20428	172.6	446.9	.20582	52.6	222.9		1.7210	517.2	5.43	
74.5	20555	174.6	451.7	.20850	51.5	223.1		1.7126	520.5	5.60	
75.0	20682	175.3	453.5	.21119	50.6	223.1		1.7041	523.4	5.74	
75.5	20830	176.5	456.7	.21435	49.4	223.1		1.6942	526.8	5.91	
76.0	20978	183.5	475.2	.21758	48.3	222.9		1.6843	529.8	6.29	
76.5	21126	186.7	483.4	.22091	47.2	222.9		1.6744	533.3	6.54	
77.0	21274	183.5	474.5	.22423	46.1	223.3		1.6646	537.6	6.58	
77.5	21422	181.9	470.8	.22752	45.1	223.1		1.6547	540.7	6.67	
78.0	21570	183.6	474.0	.23080	44.1	223.6		1.6448	545.5	6.89	
78.5	21718	182.6	473.0	.23409	43.1	222.9		1.6349	547.4	7.01	

CONTINUED ON NEXT PAGE

TABLE 17. Sample of data listing for an ozonesonde ascent (continued)

STATION	ALASKA	LAUNCH DATE	51663	LAUNCH ZULU	2358	SUNDE NUMBER	515
79.0	21866	177.2	458.1	.23732	42.1	223.3	1.6250 551.8 6.96
79.5	22014	174.4	451.6	.24048	41.2	222.9	1.6151 554.5 7.01
80.0	22162	178.0	461.4	.24364	40.3	222.8	1.6053 557.7 7.32
80.5	22296	175.7	455.0	.24652	39.4	222.9	1.5963 561.4 7.37
81.0	22430	166.0	429.8	.24930	38.6	222.9	1.5874 564.7 7.11
81.5	22564	167.9	434.4	.25201	37.8	223.1	1.5784 568.5 7.34
82.0	22698	168.4	436.7	.25474	37.1	222.6	1.5695 570.6 7.51
82.5	22832	161.0	417.2	.25742	36.3	222.8	1.5605 574.4 7.33
83.0	22966	147.7	384.1	.25993	35.6	222.1	1.5516 576.0 6.87
83.5	23099	140.8	366.4	.26227	34.8	221.9	1.5427 578.9 6.69
84.0	23233	132.5	343.0	.26449	34.1	222.9	1.5337 585.0 6.42
84.5	23367	130.5	336.9	.26663	33.4	223.6	1.5248 590.3 6.46
85.0	23502	130.4	335.7	.26875	32.8	224.3	1.5158 595.5 6.58
85.5	23659	129.1	332.3	.27121	32.0	224.3	1.5054 599.6 6.68
86.0	23816	133.5	343.0	.27370	31.2	224.8	1.4950 605.1 7.07
86.5	23974	130.4	334.8	.27620	30.5	224.9	1.4845 609.7 7.08
87.0	24132	130.9	335.8	.27867	29.7	225.1	1.4741 614.3 7.28
87.5	24290	129.5	331.2	.28114	29.0	225.7	1.4637 620.3 7.37
88.0	24448	124.1	317.4	.28354	28.4	225.7	1.4533 624.6 7.24
88.5	24606	124.9	319.2	.28590	27.7	225.9	1.4428 629.3 7.46
89.0	24764	129.2	329.8	.28831	27.0	226.2	1.4324 634.5 7.91
89.5	24923	125.8	321.2	.29073	26.4	226.1	1.4220 638.5 7.88
90.0	25082	120.8	308.3	.29306	25.8	226.2	1.4116 643.3 7.75
90.5	25224	115.7	295.5	.29507	25.2	226.1	1.4022 646.8 7.59
91.0	25366	109.3	279.0	.29699	24.7	226.2	1.3929 651.3 7.33
91.5	25508	104.1	265.5	.29880	24.1	226.4	1.3835 655.7 7.13
92.0	25651	103.4	263.5	.30057	23.6	227.0	1.3741 661.6 7.25
92.5	25794	99.5	252.8	.30229	23.1	227.3	1.3648 666.6 7.12
93.0	25937	101.6	257.5	.30400	22.6	227.8	1.3554 672.1 7.42
93.5	26080	100.3	254.4	.30572	22.1	227.6	1.3461 675.8 7.49
94.0	26223	97.7	247.6	.30740	21.7	227.9	1.3367 680.8 7.45
94.5	26366	95.9	242.6	.30905	21.2	228.2	1.3274 686.0 7.48
95.0	26510	93.4	236.1	.31066	20.8	228.4	1.3180 690.7 7.44
95.5	26660	91.5	231.4	.31231	20.3	228.2	1.3082 694.7 7.45
96.0	26810	89.6	226.8	.31392	19.8	228.2	1.2984 699.2 7.47
96.5	26960	88.8	225.2	.31551	19.4	227.8	1.2886 702.3 7.57
97.0	27110	86.4	218.8	.31707	19.0	228.1	1.2788 707.8 7.53
97.5	27260	86.3	218.2	.31860	18.5	228.2	1.2690 712.8 7.69
98.0	27410	82.6	208.7	.32011	18.1	228.4	1.2592 717.9 7.53
98.5	27560	77.5	195.8	.32153	17.7	228.5	1.2494 723.0 7.23
99.0	27711	78.8	198.8	.32292	17.3	228.8	1.2396 728.6 7.52
99.5	27862	78.7	198.3	.32433	16.9	229.1	1.2299 734.3 7.68
100.0	28013	78.7	198.3	.32573	16.6	229.1	1.2201 739.0 7.85
100.5	28177	78.7	198.3	.32724	16.1	229.1	1.2094 744.2 8.05
101.0	28341	79.8	200.4	.32877	15.8	230.0	1.1988 752.3 8.27
101.5	28505	80.5	202.1	.33032	15.4	230.2	1.1882 758.1 8.65
102.0	28669	77.4	194.0	.33185	15.0	230.3	1.1776 763.9 8.52
102.5	28833	69.6	174.6	.33326	14.6	230.3	1.1670 769.2 7.85
103.0	28998	60.7	151.9	.33452	14.3	230.7	1.1564 776.1 7.01
103.5	29163	58.9	147.5	.33568	13.9	230.6	1.1457 781.1 6.98
104.0	29328	58.9	147.5	.33681	13.6	230.7	1.1351 787.0 7.15
104.5	29493	57.1	142.4	.33793	13.3	231.6	1.1245 795.5 7.10
105.0	29658	54.1	135.2	.33901	13.0	231.2	1.1139 799.6 6.90
105.5	29849	52.2	130.4	.34019	12.6	231.5	1.1016 807.1 6.85
106.0	30040	49.3	122.7	.34132	12.2	232.0	1.0892 815.6 6.65
106.5	30232	49.3	122.7	.34243	11.9	232.0	1.0771 822.2 6.84

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The design of the data processing and presentation techniques was established in collaboration with the Research Division, University of Dayton. Detailed procedures for processing the raw data records into the form appearing in this report were developed and carried out by the University of Dayton personnel under the direction of Mr. Nicholas Engler, Mr. William Brockman, and Mr. Joseph Boeke.

## Acknowledgments

The ozone-sonde network program has been sustained by the combined efforts of a large group of participants representing many organizations. Although it is not possible to identify the full extent of the many individual contributions to the program, the following support is singled out for special recognition.

The experimental program was made possible by the development of an effective balloon-borne ozonesonde by Dr. Victor Regener of the University of New Mexico. Dr. Regener has established field operational procedures, designed necessary auxiliary instrumentation, and maintained continuous surveillance of instrument performance.

The success of the program is due in large measure to the guidance and efforts of Mr. Robert F. Myers, who has participated in all phases of the project since its inception. Mr. Leo Jacobs has carried out instruction of field personnel and solution of observational problems arising during the course of the program. Mr. Donald W. McLeod has served as field coordinator handling program logistics.

Excellent cooperation has been received from the station personnel throughout the program. The work has been undertaken with exceptional understanding, care, and efficiency. The officials in charge of the individual ozonesonde stations are as follows: Lt. Col. H. T. Barlow, Thule AFB; Dr. Richard A. Craig, Florida State University; Mr. O. A. Egan, Goose Bay, Labrador; Mr. R. J. Frazer, Ft. Churchill, Canada; Mr. Louis Grant, Colorado State University; Major Eugene R. Hoppe, Fairbanks, Alaska; Dr. P. E. Kuhn, University of Wisconsin; Major George A. Lockhart, Jr., Howard AFB; Dr. Richard Reed, University of Washington; and Dr. Victor Regener, University of New Mexico.

TABLE 17. Sample of data listing for an ozonesonde ascent (continued)

STATION ALASKA			LAUNCH DATE 51663		LAUNCH ZULU 2358		SONDE NUMBER 515	
107.0	30424	46.9	116.9	.34350	11.6	231.9	1.0648	828.4 6.70
107.5	30616	45.7	113.4	.34453	11.2	232.6	1.0525	837.7 6.71
108.0	30808	48.7	120.9	.34559	10.9	232.5	1.0403	843.9 7.35
108.5	31000	43.3	107.4	.34661	10.6	232.7	1.0280	851.8 6.73
109.0	31193	43.9	108.4	.34758	10.3	233.7	1.0157	862.4 7.01
109.5	31386	42.1	104.2	.34854	10.0	233.4	1.0034	868.3 6.93
110.0	31579	40.9	101.2	.34947	9.8	233.4	.9912	875.3 6.92
110.5	31762	39.1	96.9	.35032	9.5	233.3	.9795	881.6 6.80
111.0	31945	39.7	98.4	.35116	9.2	233.3	.9678	888.4 7.10
111.5	32128	37.9	93.8	.35199	9.0	233.4	.9561	895.8 6.95
112.0	32312	34.9	86.4	.35276	8.8	233.6	.9444	903.2 6.58



## References

1. V. REGENER, On a sensitive method for the recording of atmospheric ozone, J. Geophys. Research **65** (No. 12): 3975-3977, Dec. 1960.

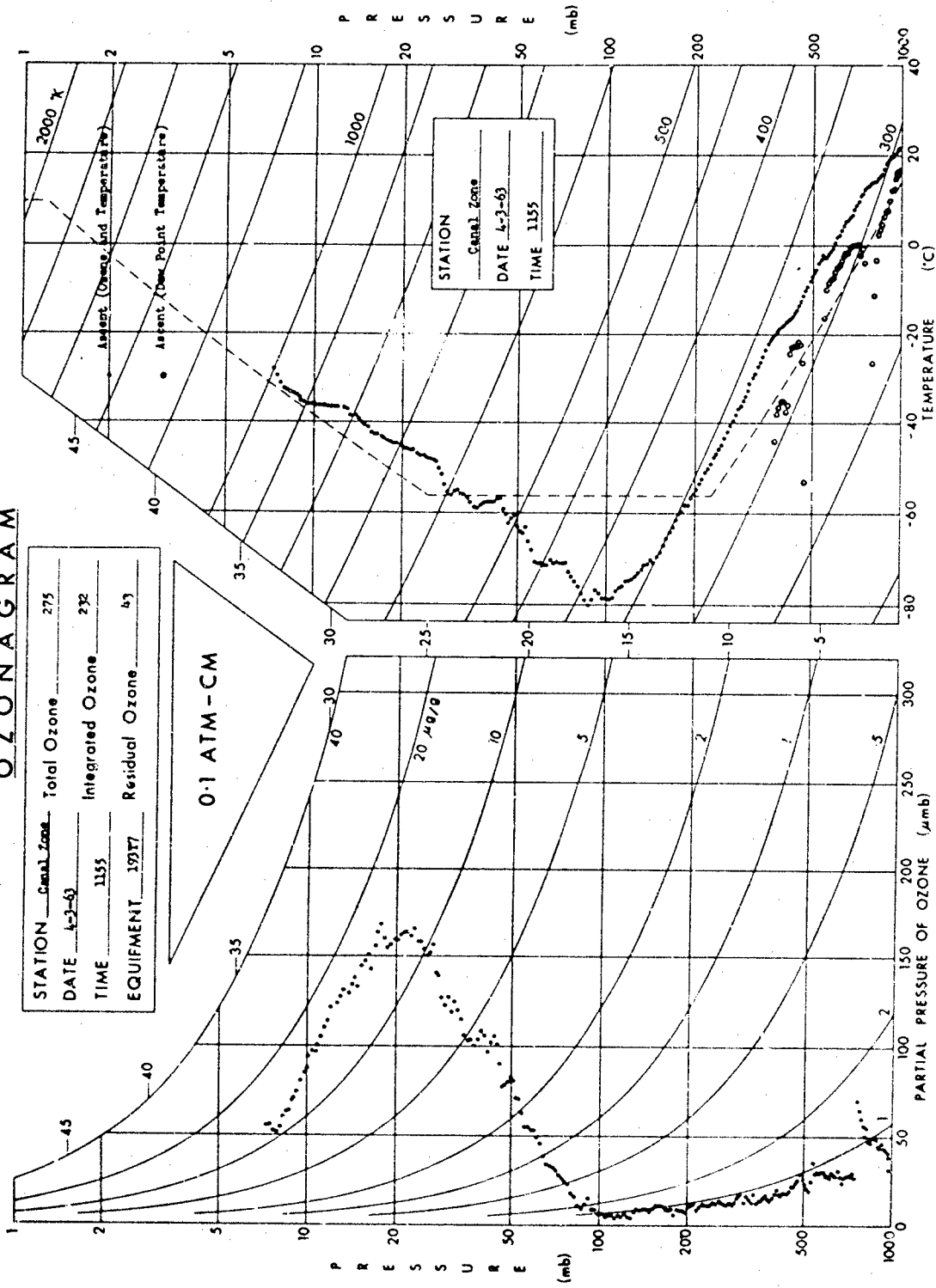
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## **Appendix**

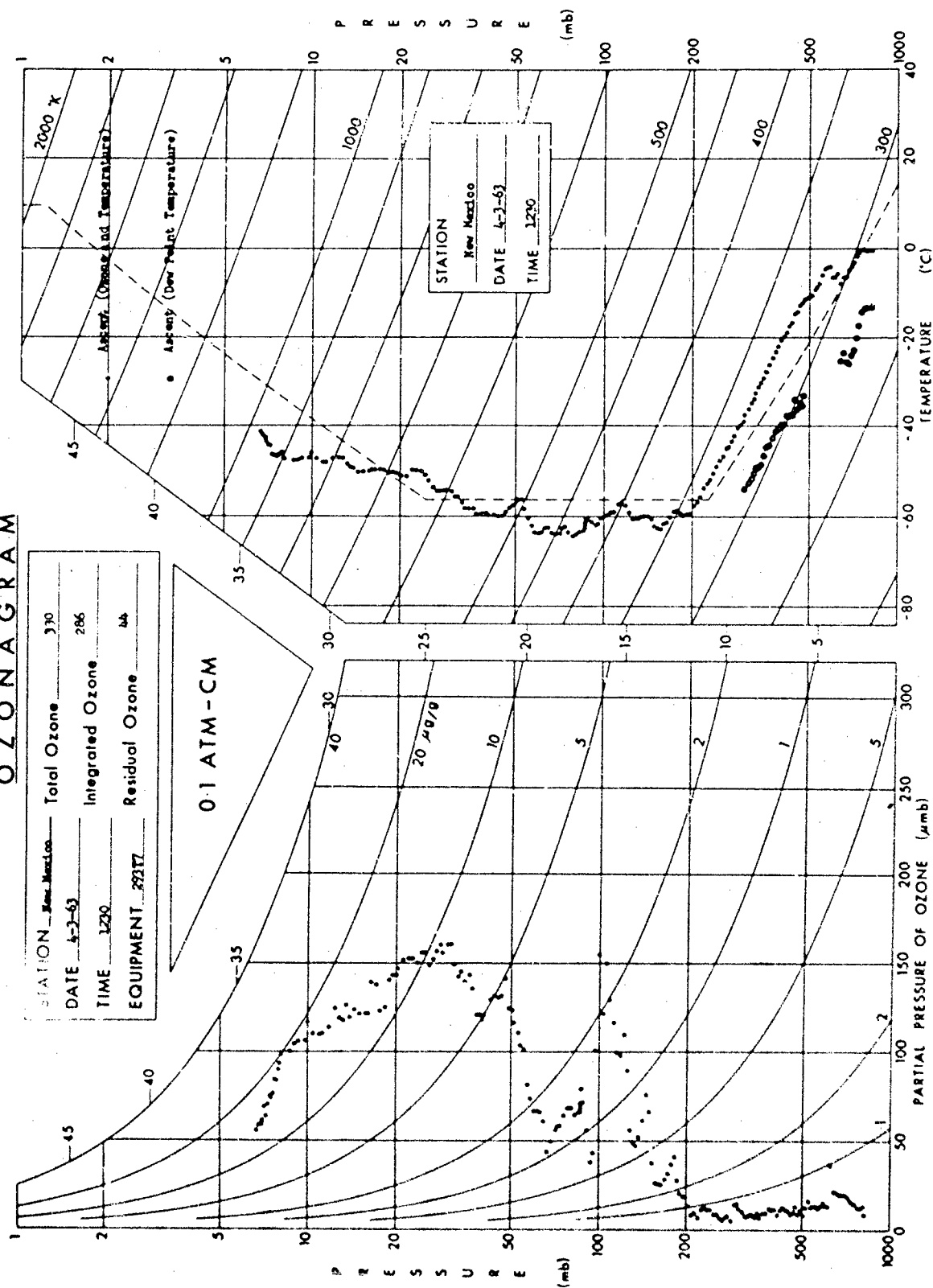
### **DATA PRESENTATION**

Provisional ozonesonde network data for the period April 1963 through August 1963 are presented in the following pages. The graphical data are arranged in chronological order and presented in the order of increasing latitude on a given observational day. All times are given in Greenwich Meridian Time.

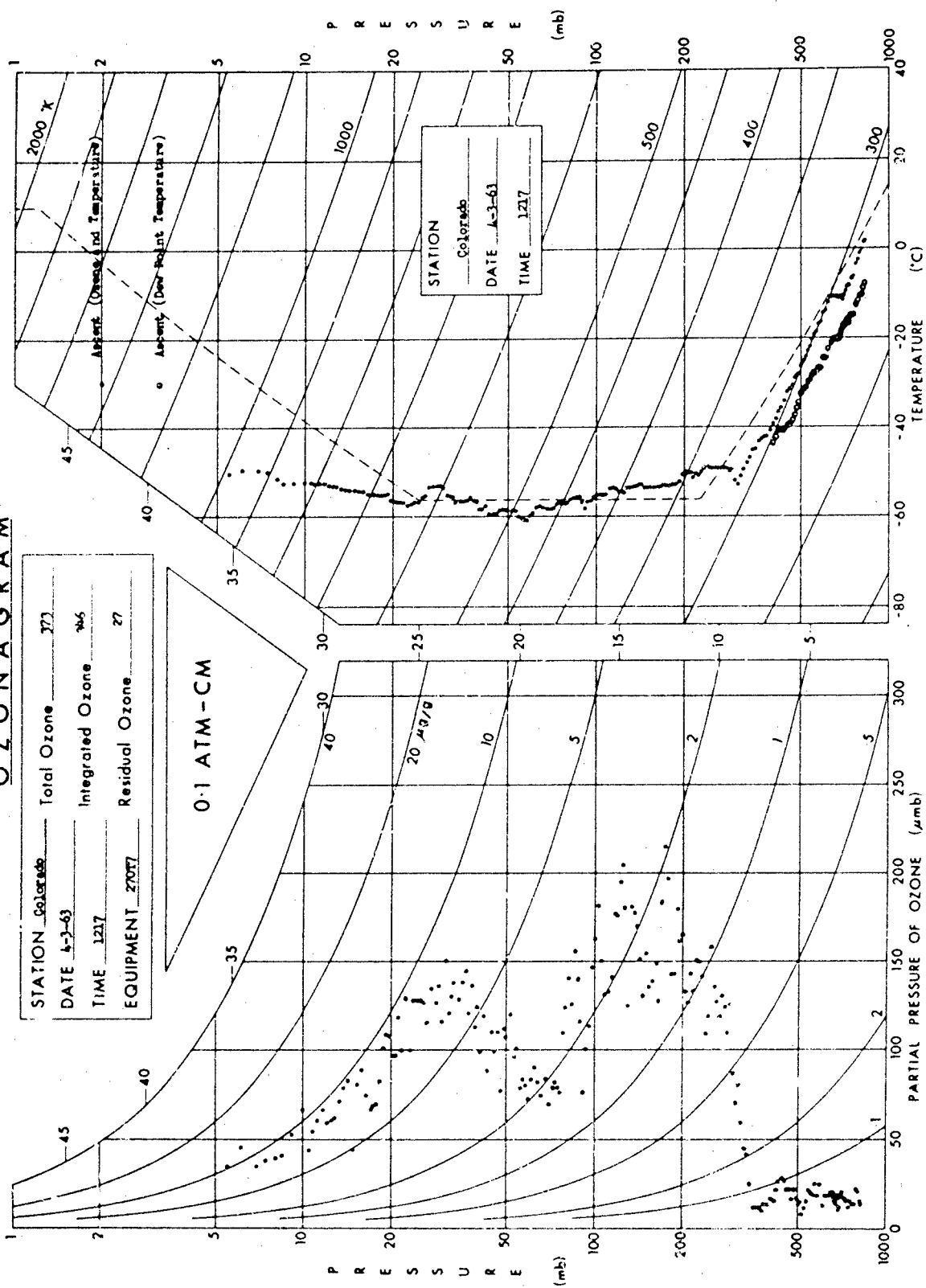
# OZONAGRAM



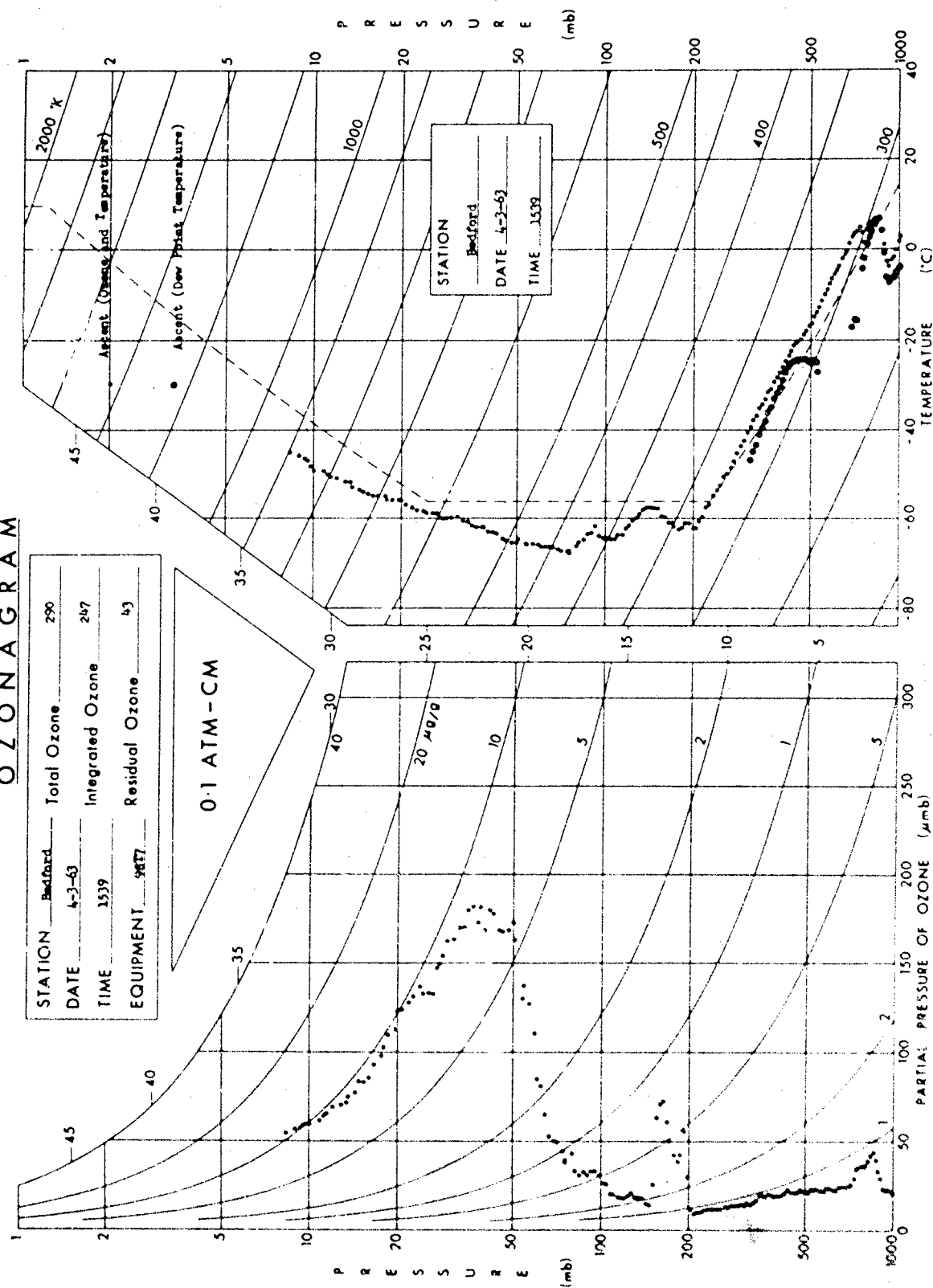
# OZONAGRAM



## OZONAGRAM



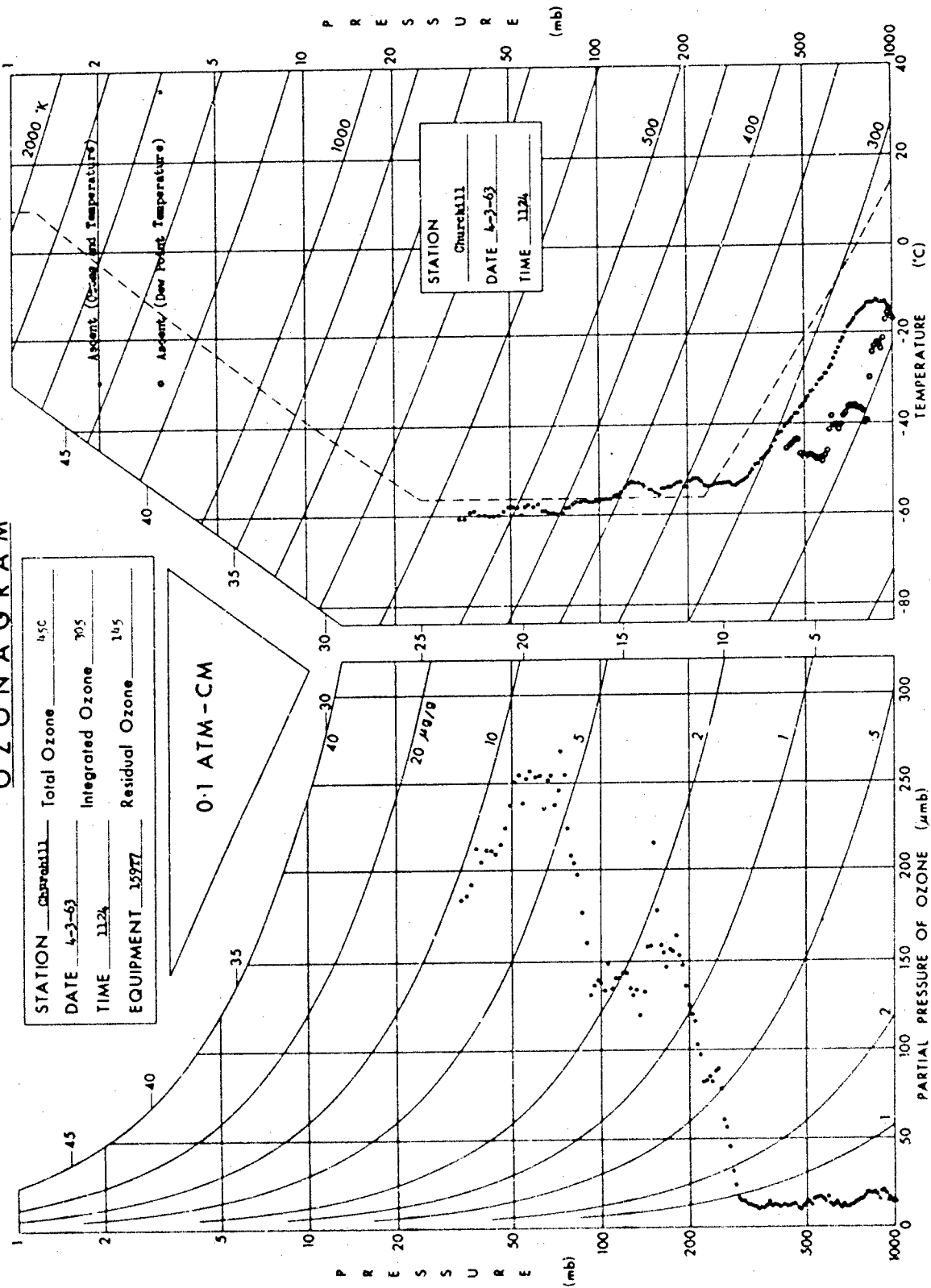
## OZONAGRAM



## OZONAGRAM

STATION Churchill Total Ozone 450  
 DATE 4-3-63 Integrated Ozone 705  
 TIME 1124 Residual Ozone 165  
 EQUIPMENT 15977

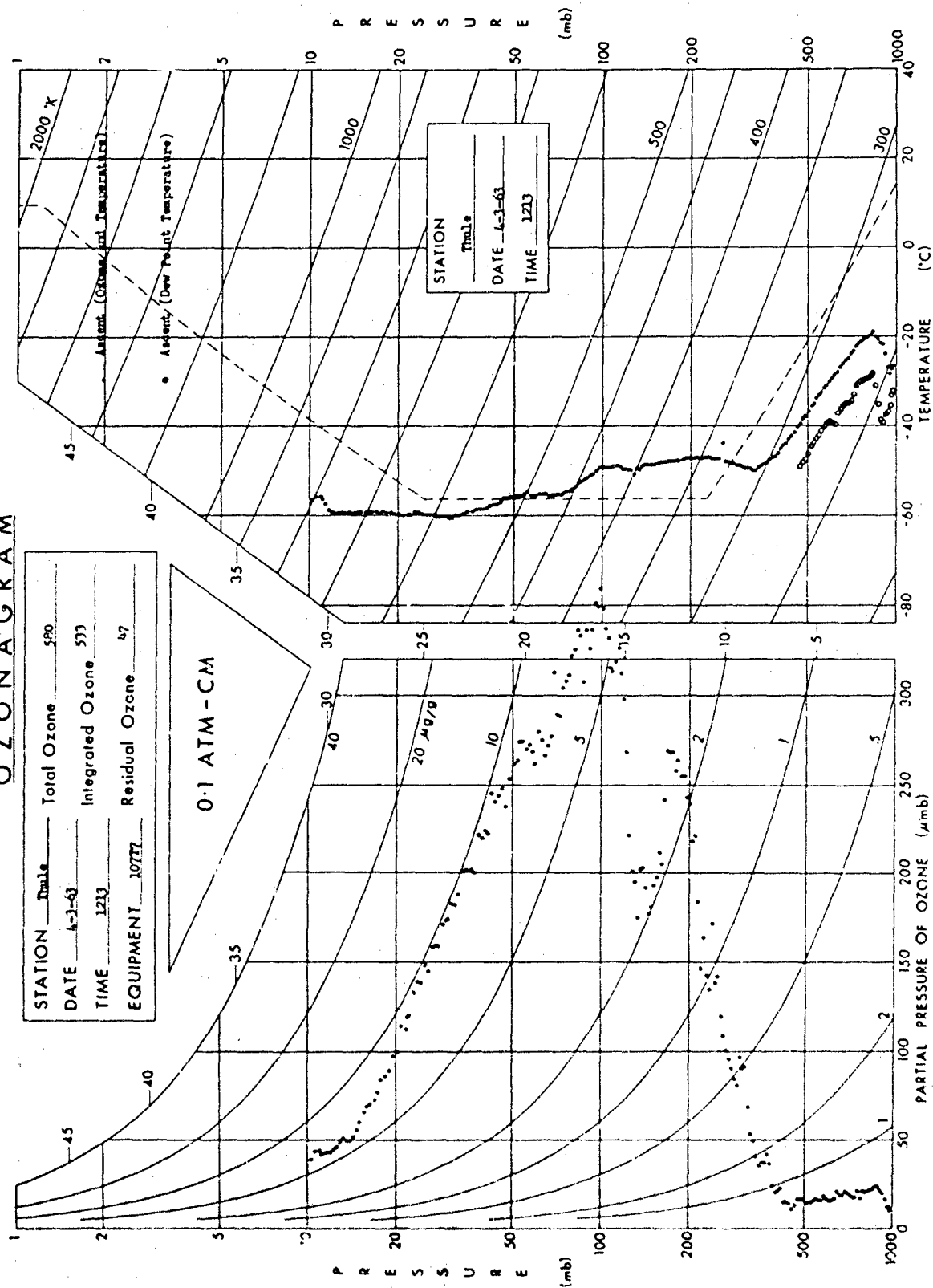
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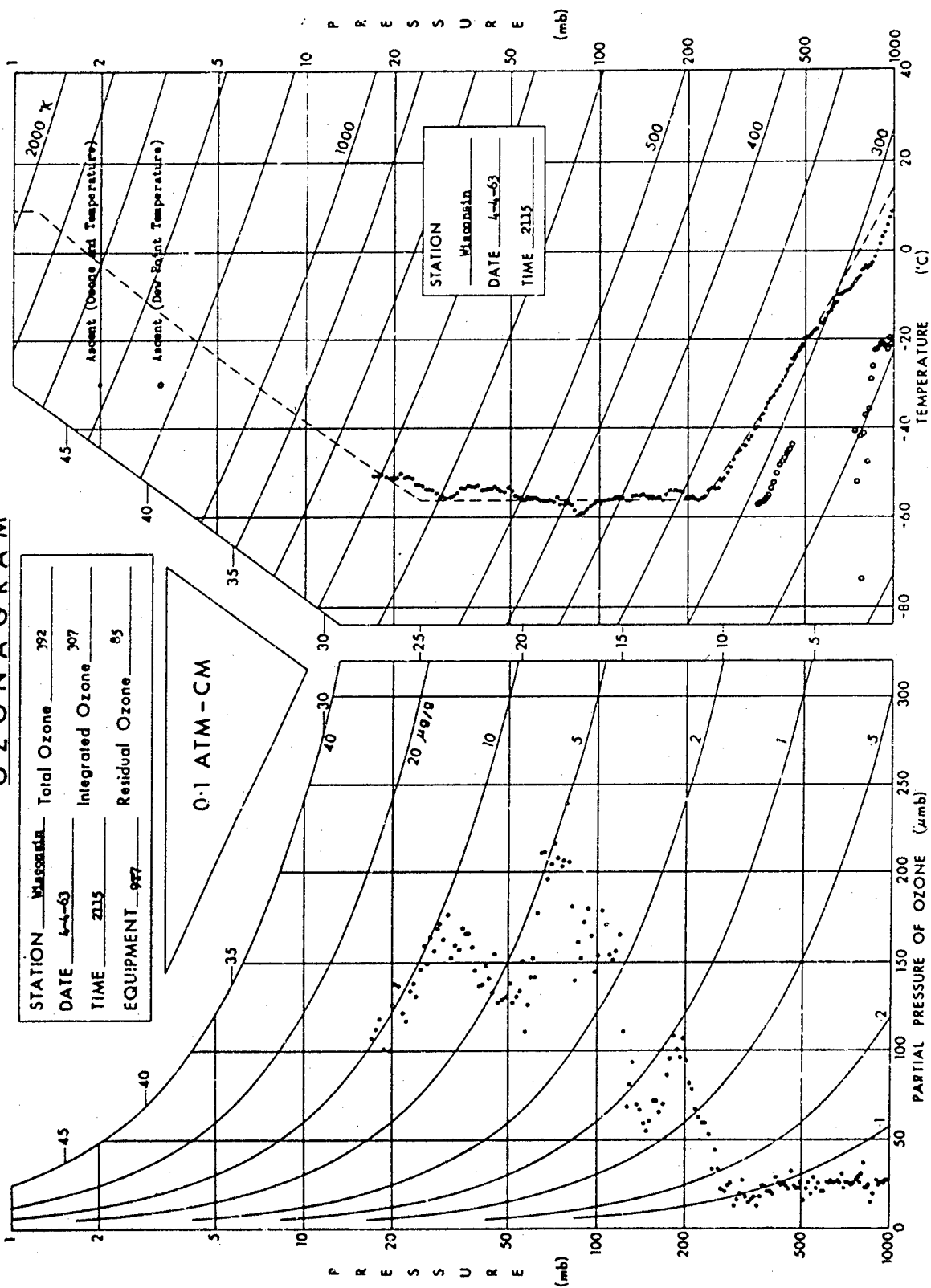




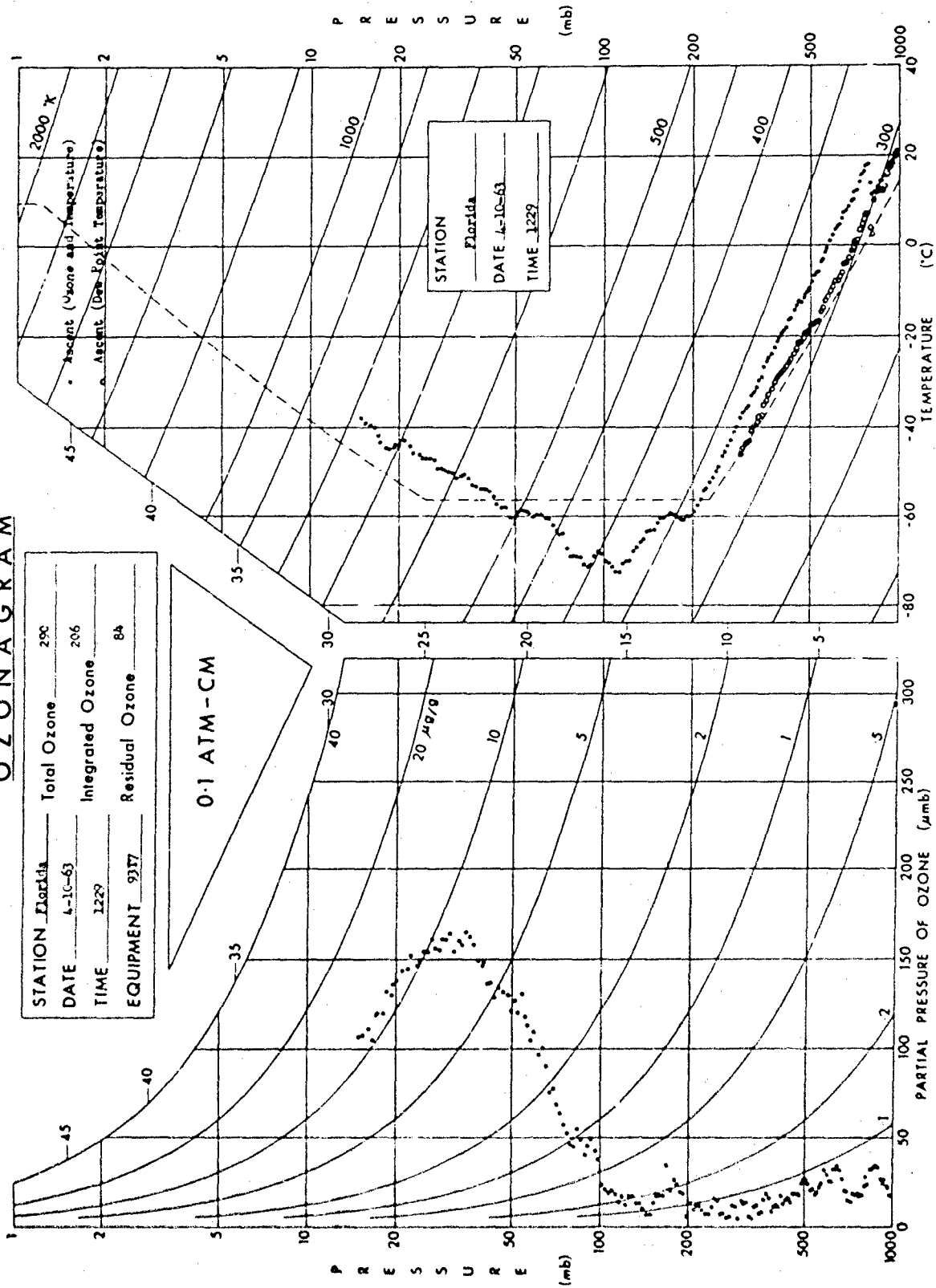
## OZONAGRAM



## OZONAGRAM



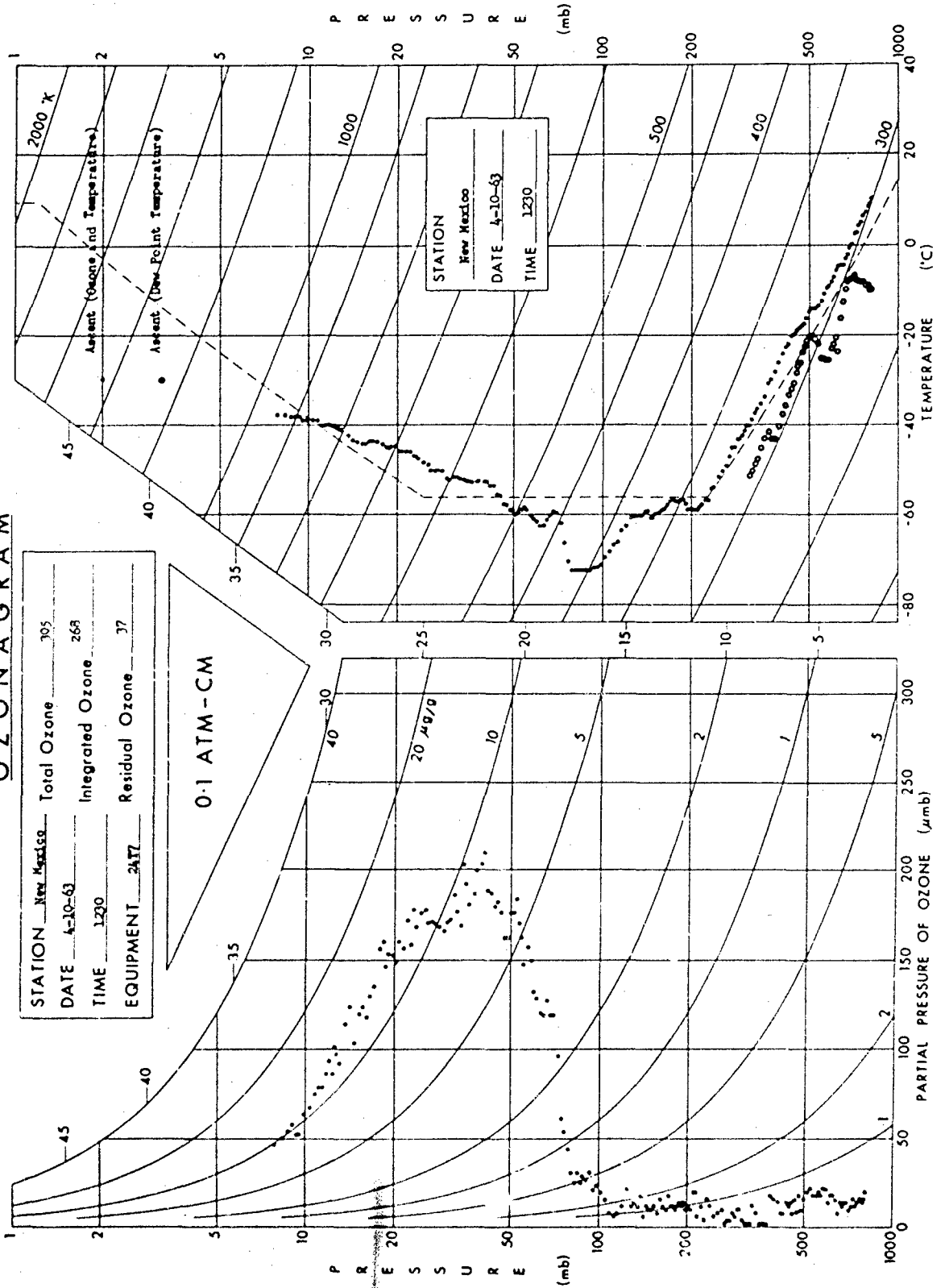
## O Z O N A G R A M



# OZONAGRAM

STATION	New Mexico	Total Ozone	105
DATE	4-10-63	Integrated Ozone	269
TIME	1200	Residual Ozone	37
EQUIPMENT	247		

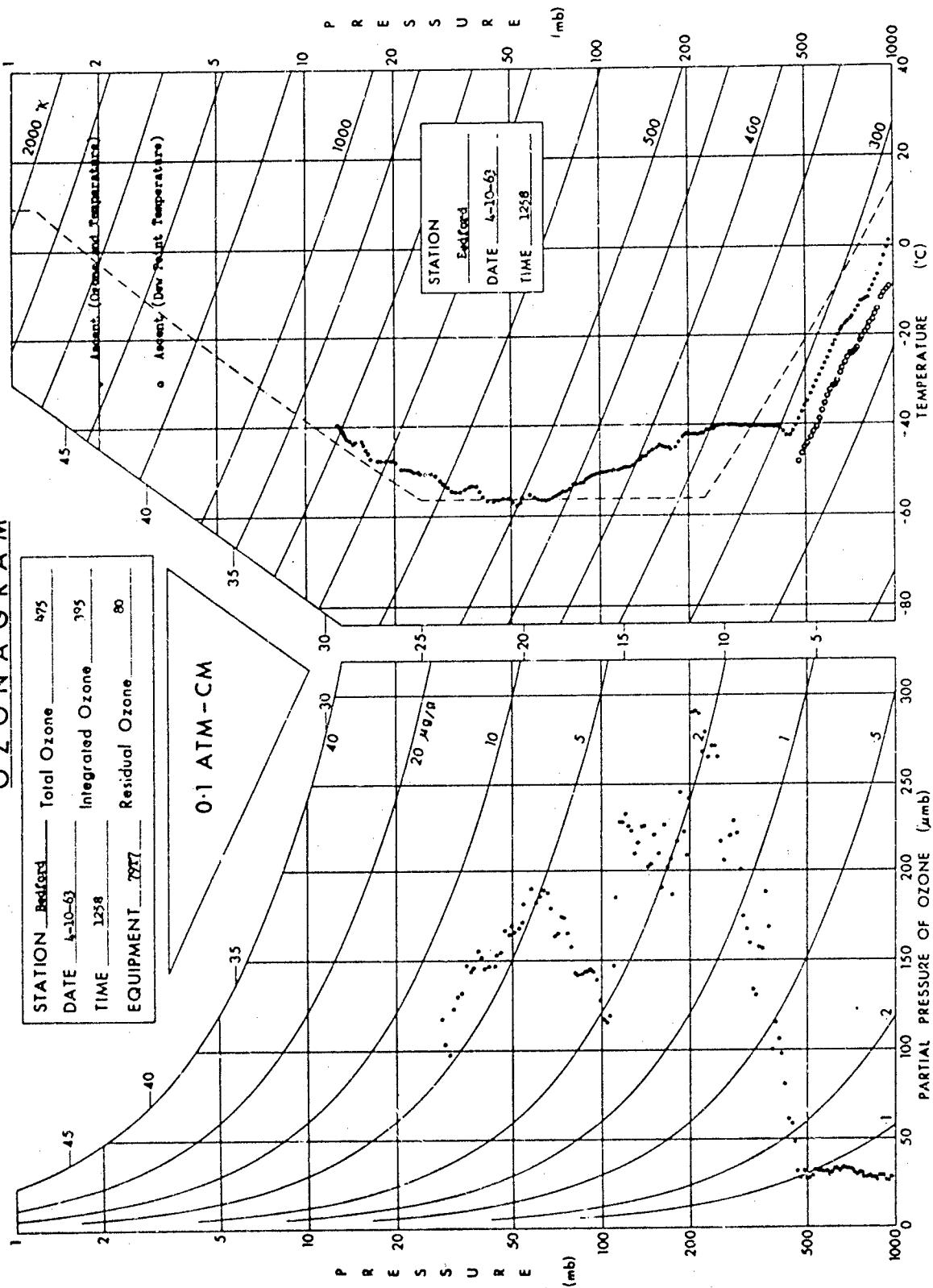
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## O Z O N A G R A M

STATION <u>Bedford</u>	Total Ozone	<u>475</u>
DATE <u>4-10-63</u>	Integrated Ozone	<u>195</u>
TIME <u>1258</u>	Residual Ozone	<u>80</u>
EQUIPMENT <u>7927</u>		

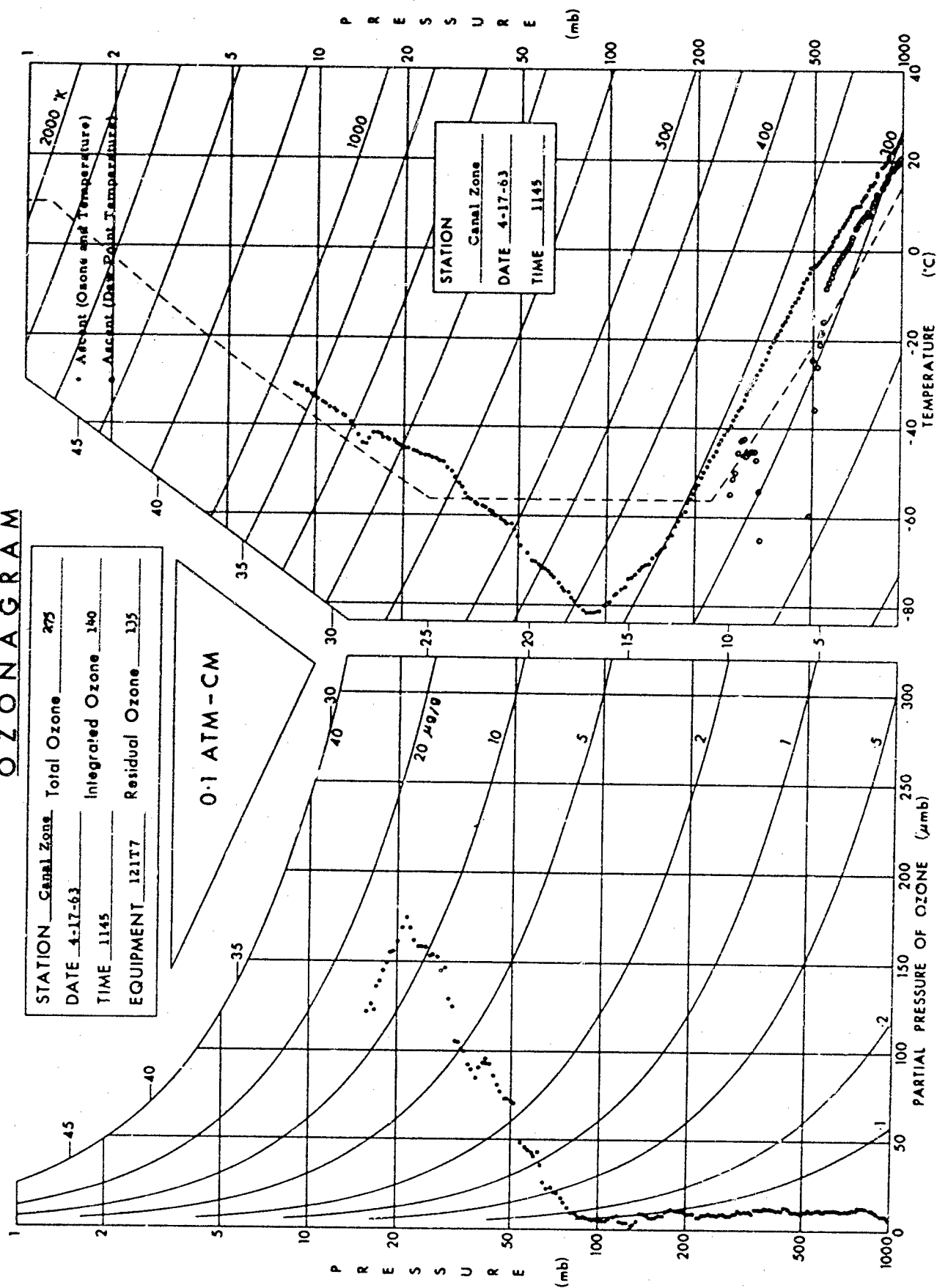
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## O Z O N A G R A M

STATION Canal Zone Total Ozone 275  
 DATE 4-17-63 Integrated Ozone 140  
 TIME 1145 Residual Ozone 135  
 EQUIPMENT 121T7

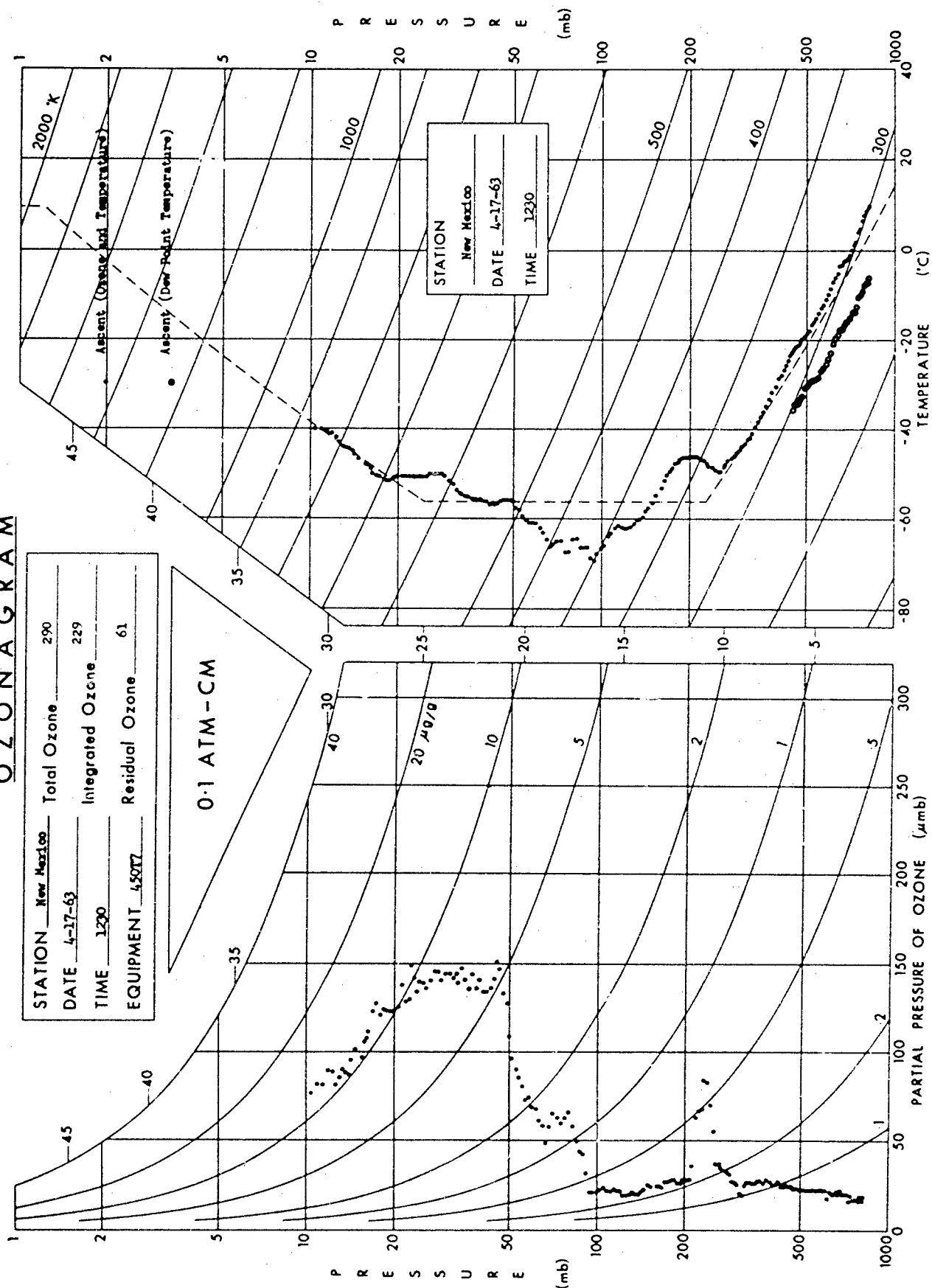
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## OZONAGRAM

STATION New Mexico Total Ozone 290  
 DATE 4-17-63 Integrated Ozone 229  
 TIME 1230 Residual Ozone 61  
 EQUIPMENT 45017

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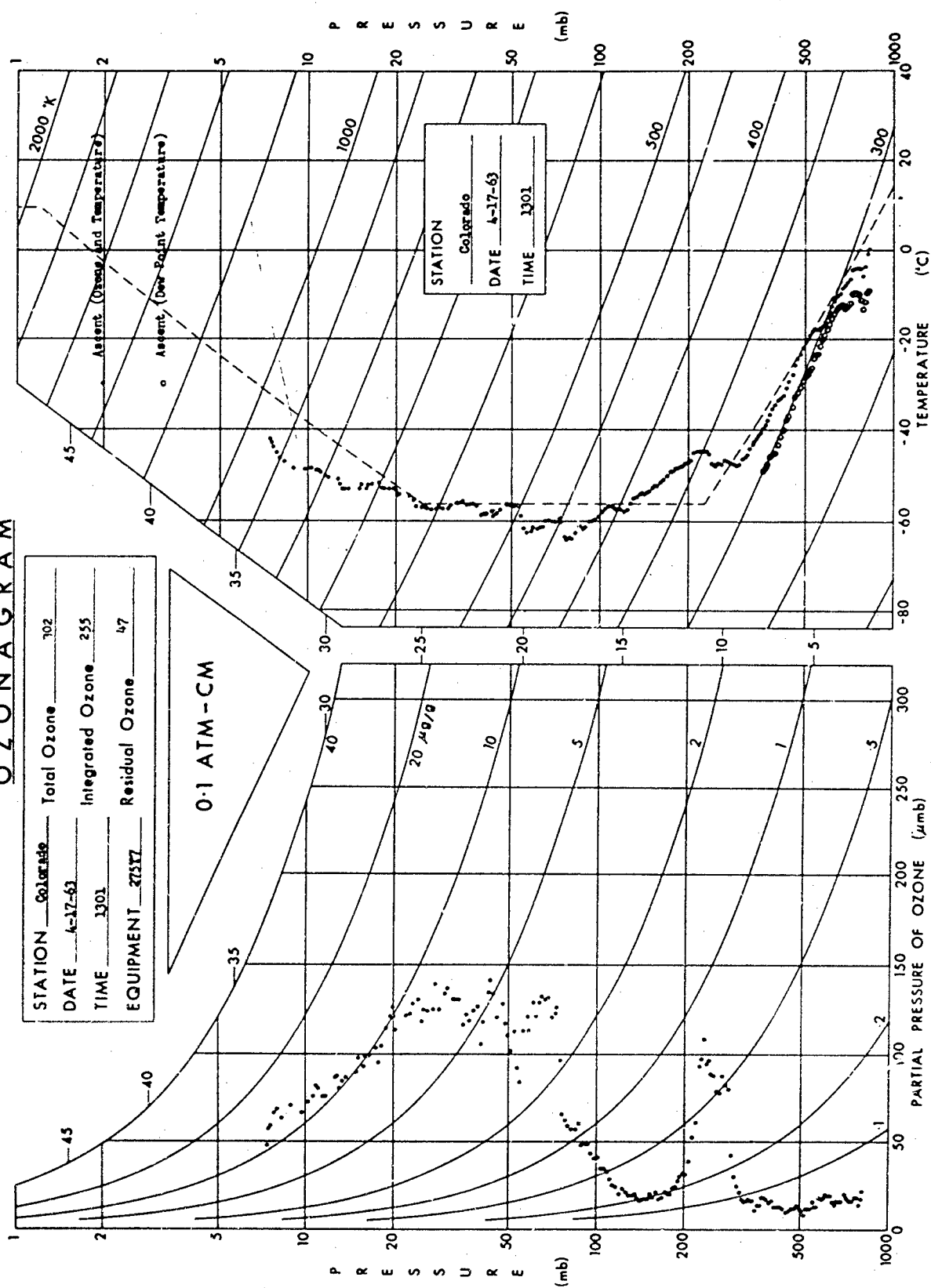




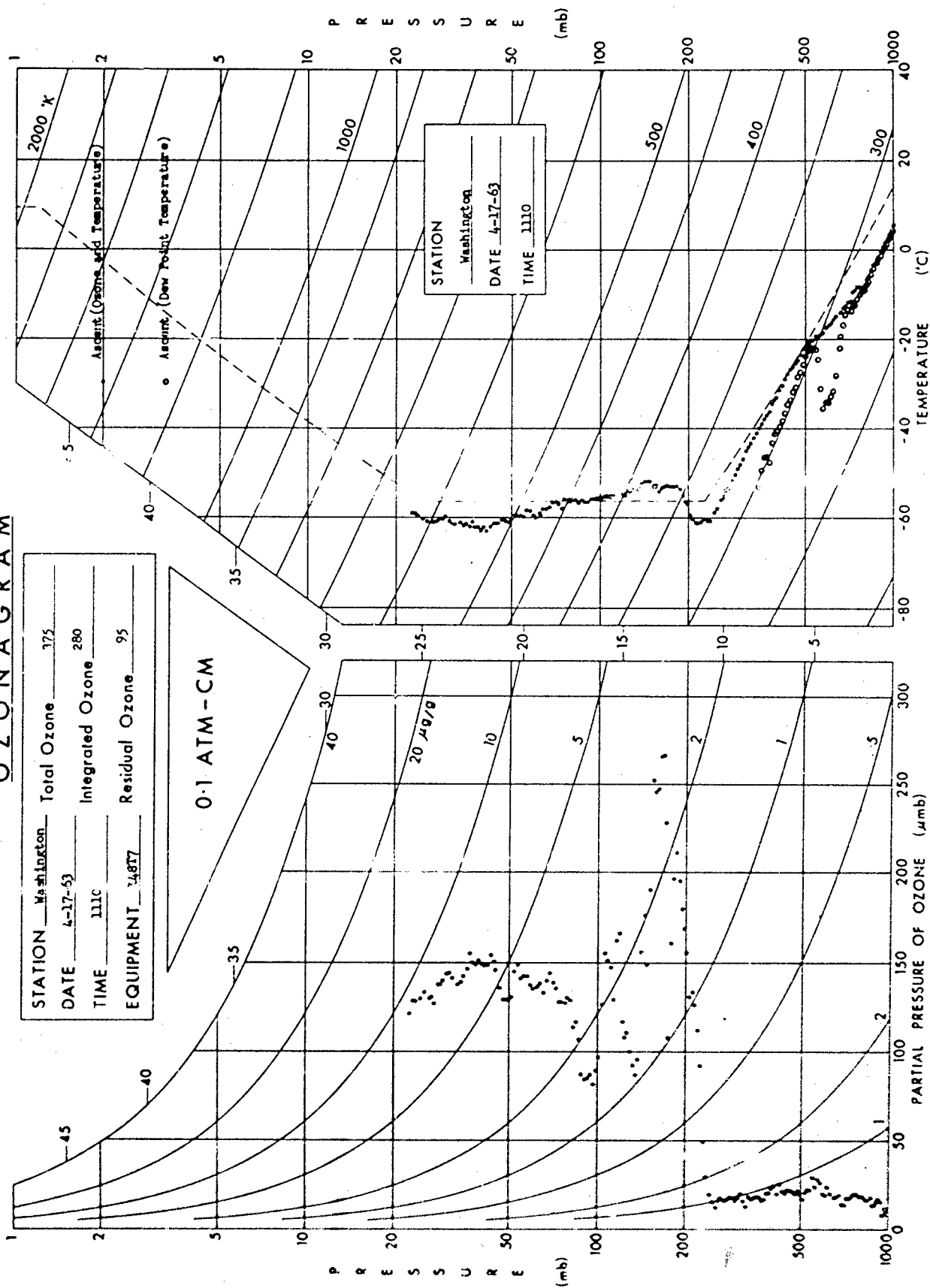
# OZONAGRAM

STATION Colorado Total Ozone 102  
 DATE 4-17-63 Integrated Ozone 255  
 TIME 1301 Residual Ozone 47  
 EQUIPMENT 27517

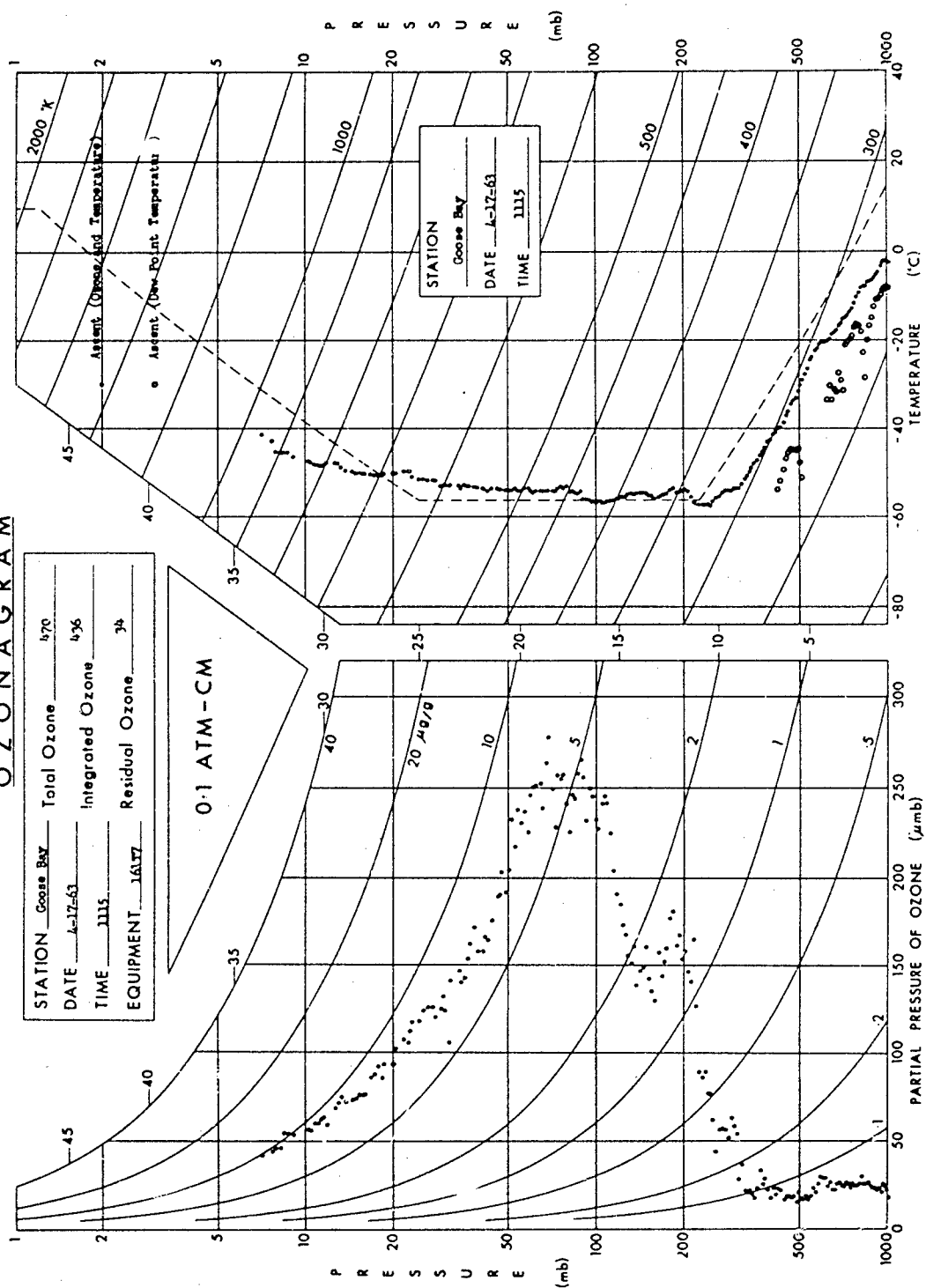
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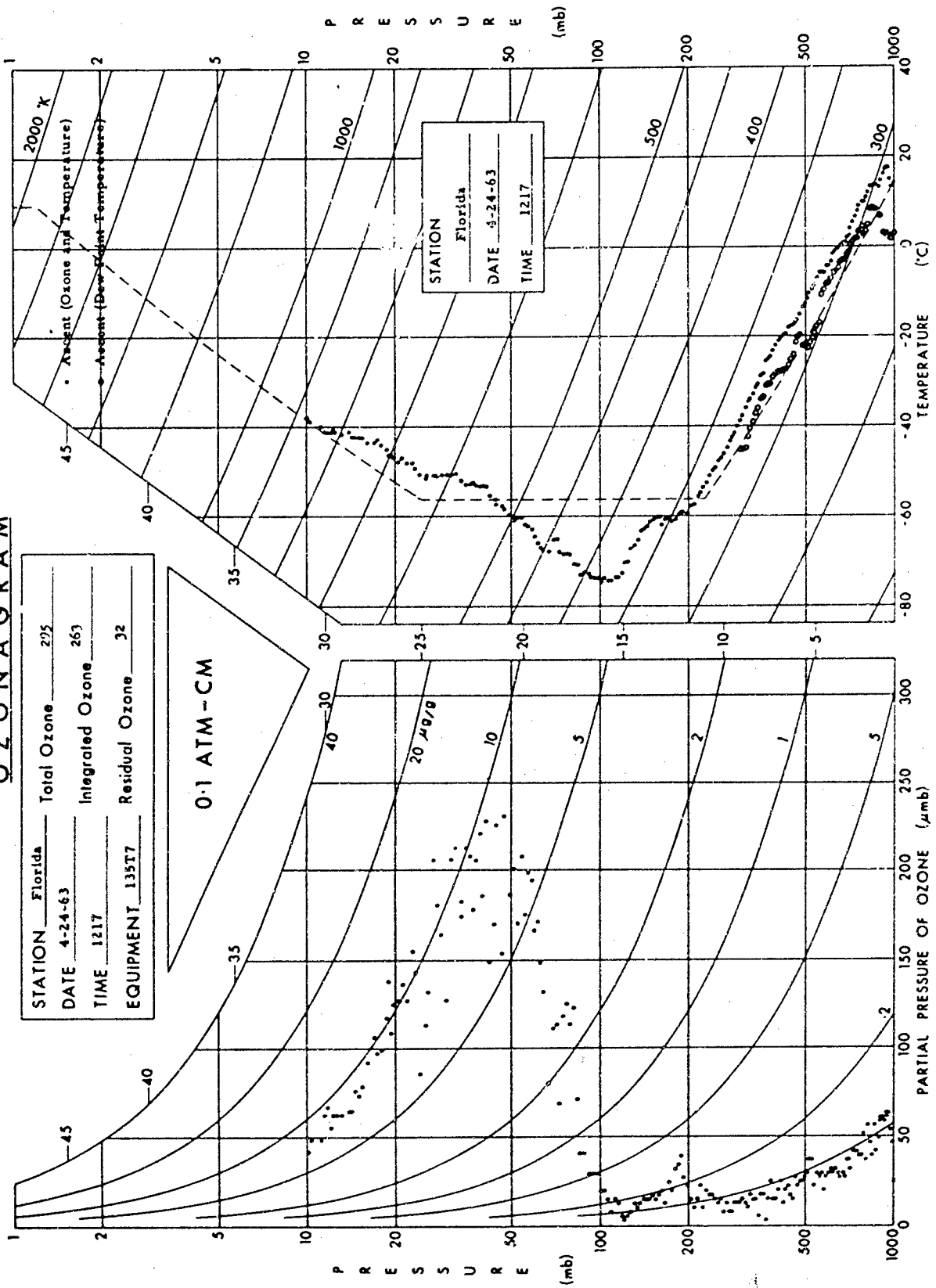
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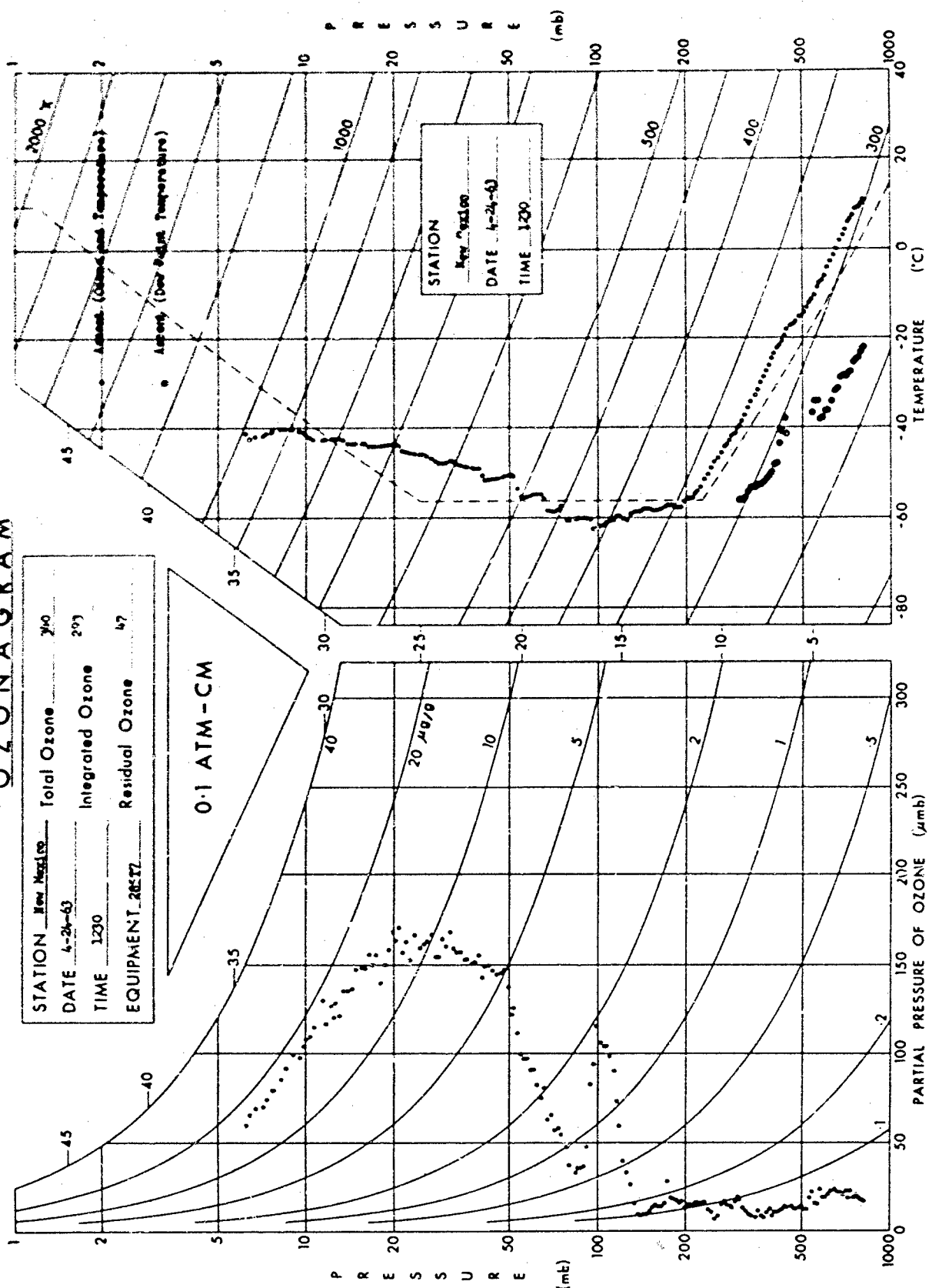
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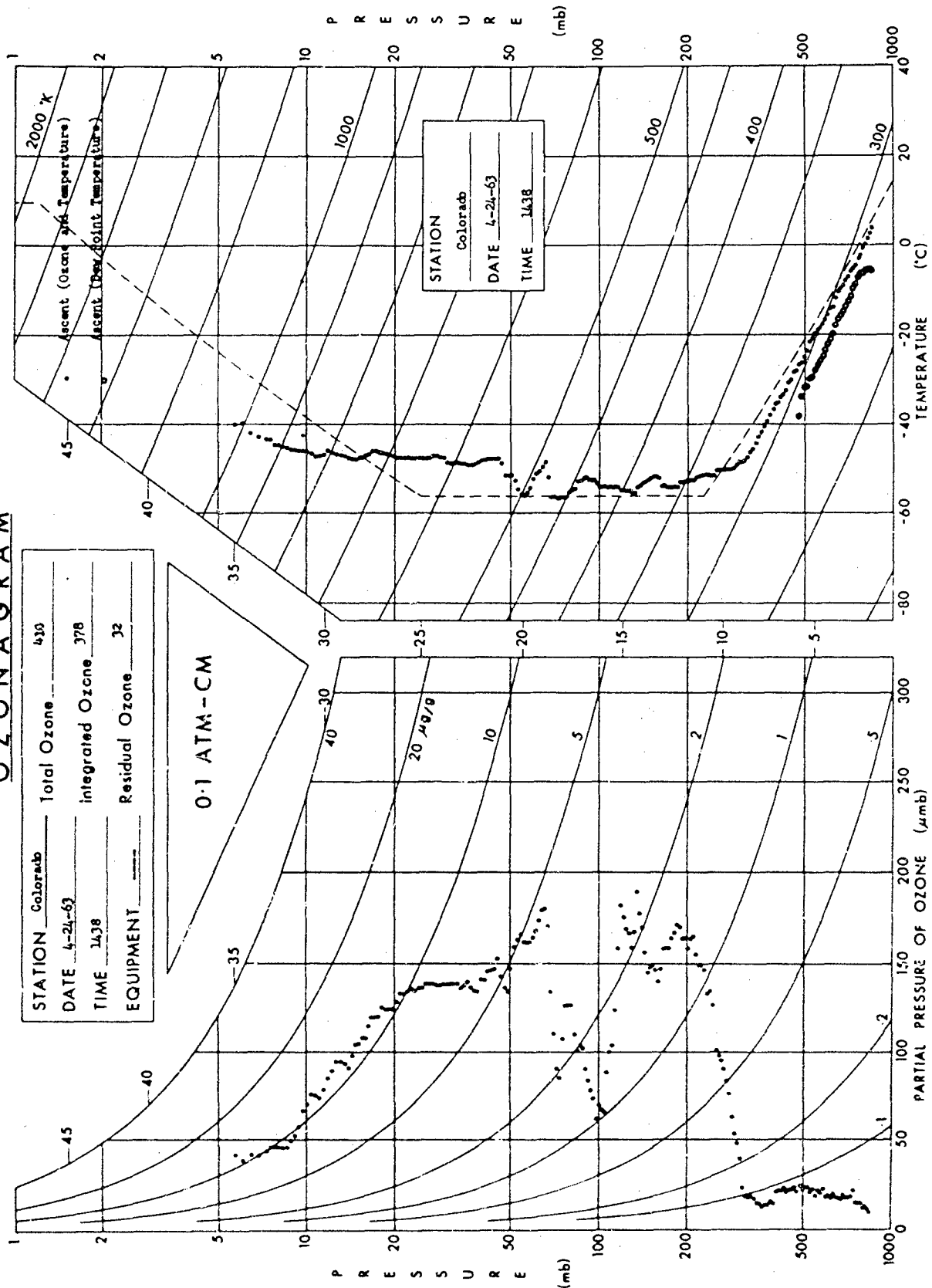
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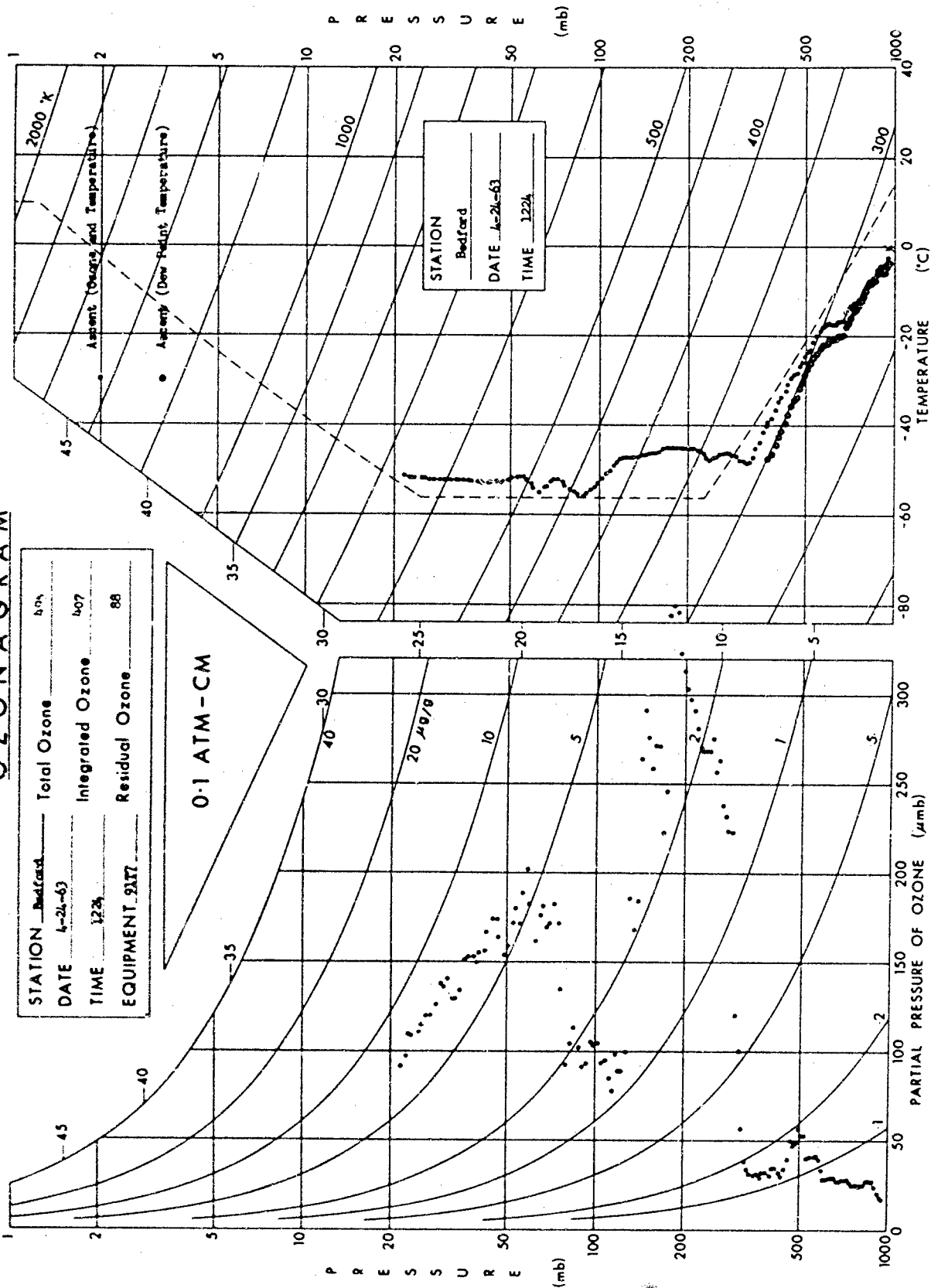
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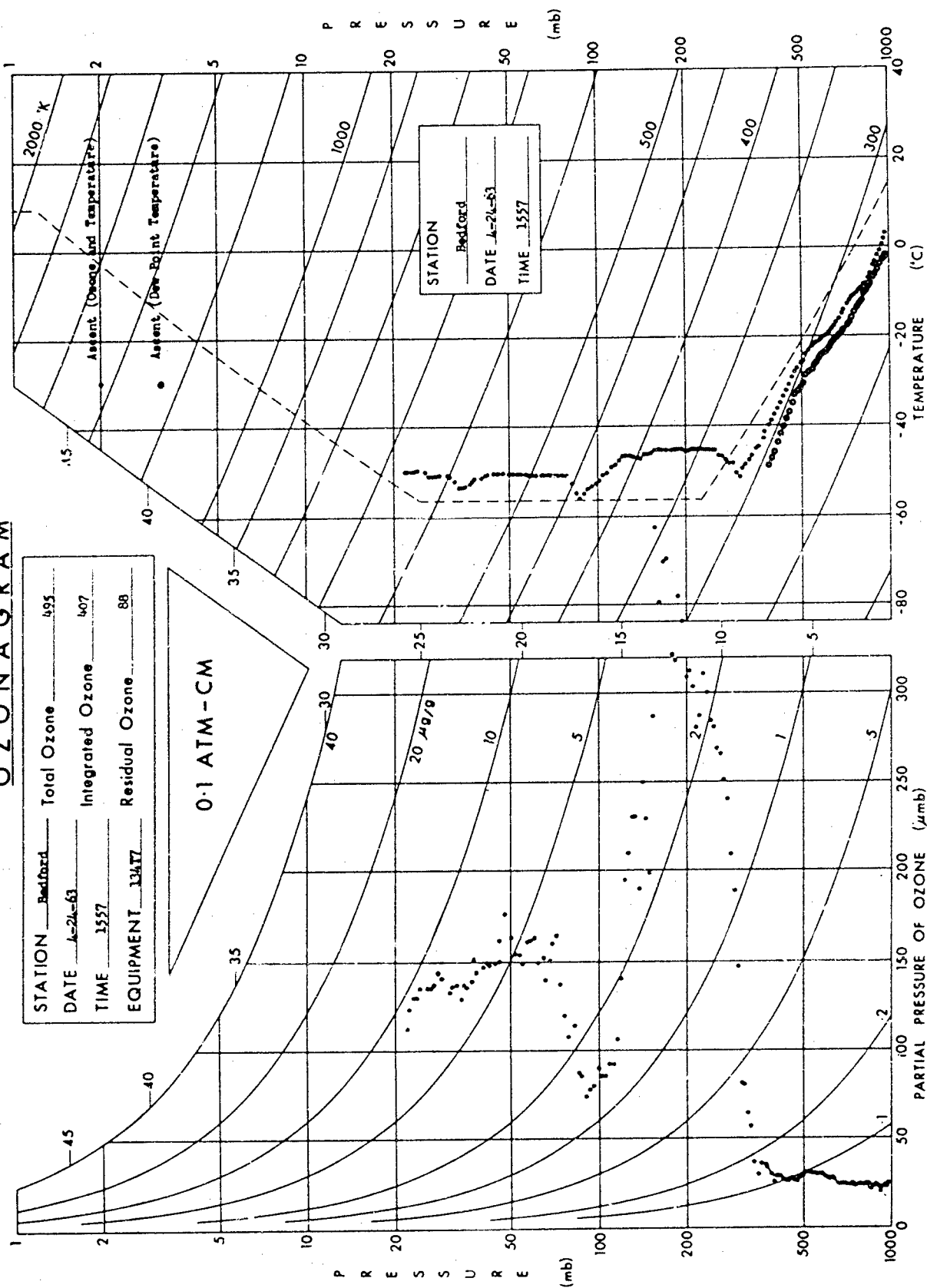
# OZONAGRAM

STATION	Bedford	Total Ozone	404
DATE	4-24-63	Integrated Ozone	607
TIME	1224	Residual Ozone	88
EQUIPMENT	917		

0.1 ATM-CM

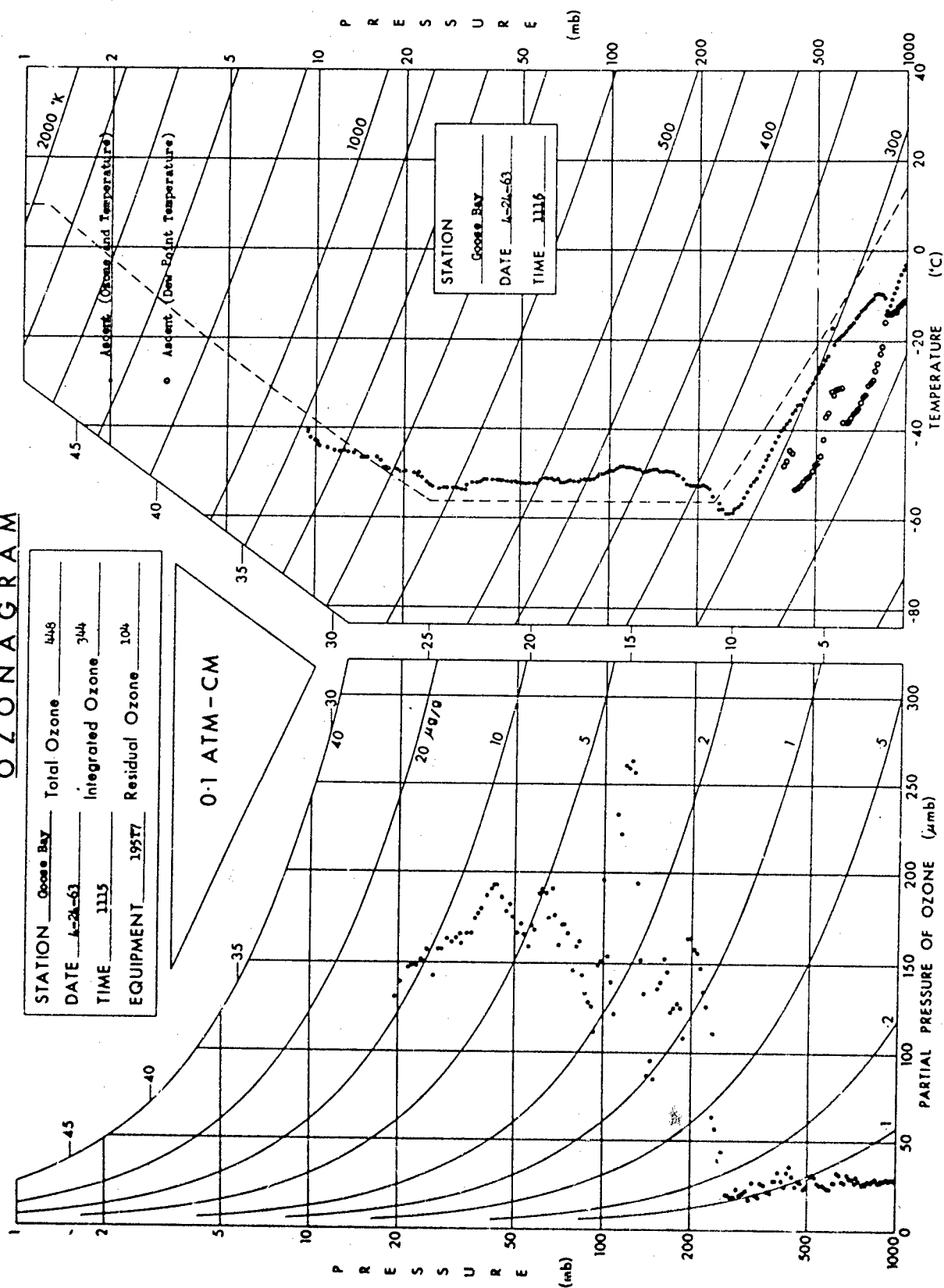


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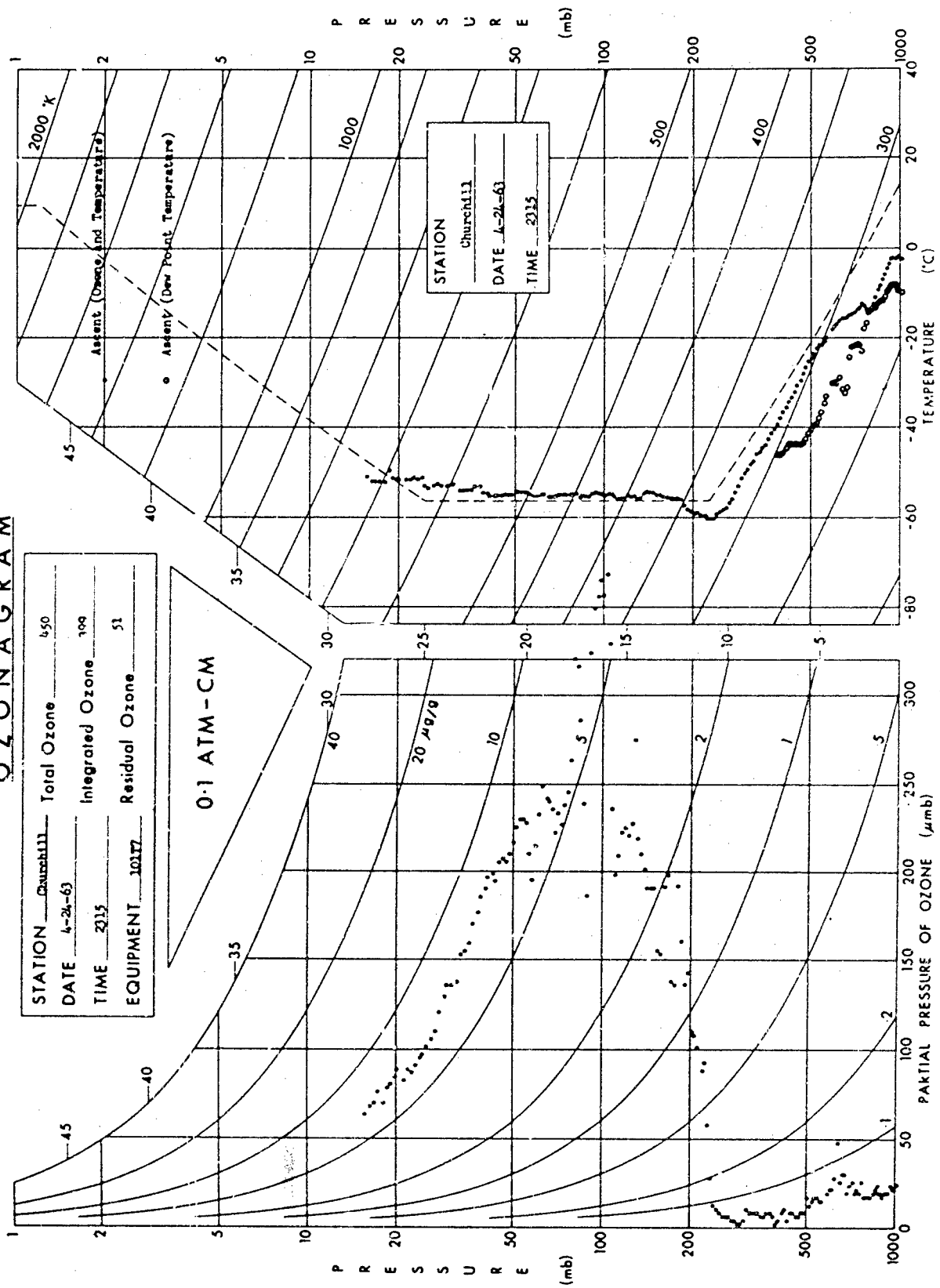




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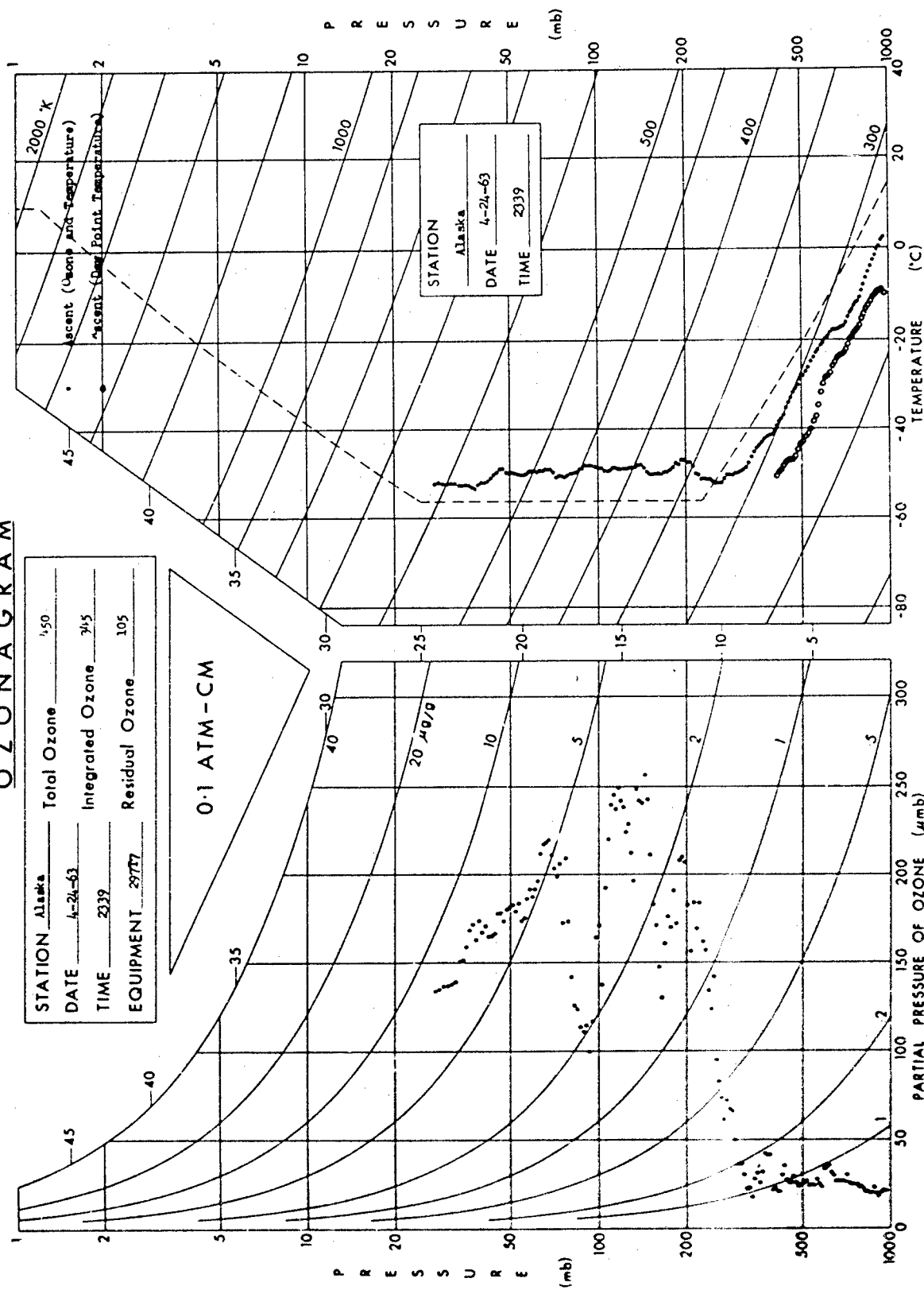
## OZONAGRAM



# OZONAGRAM

STATION	Alaska	Total Ozone	150
DATE	4-24-63	Integrated Ozone	745
TIME	2339	Residual Ozone	105
EQUIPMENT	29777		

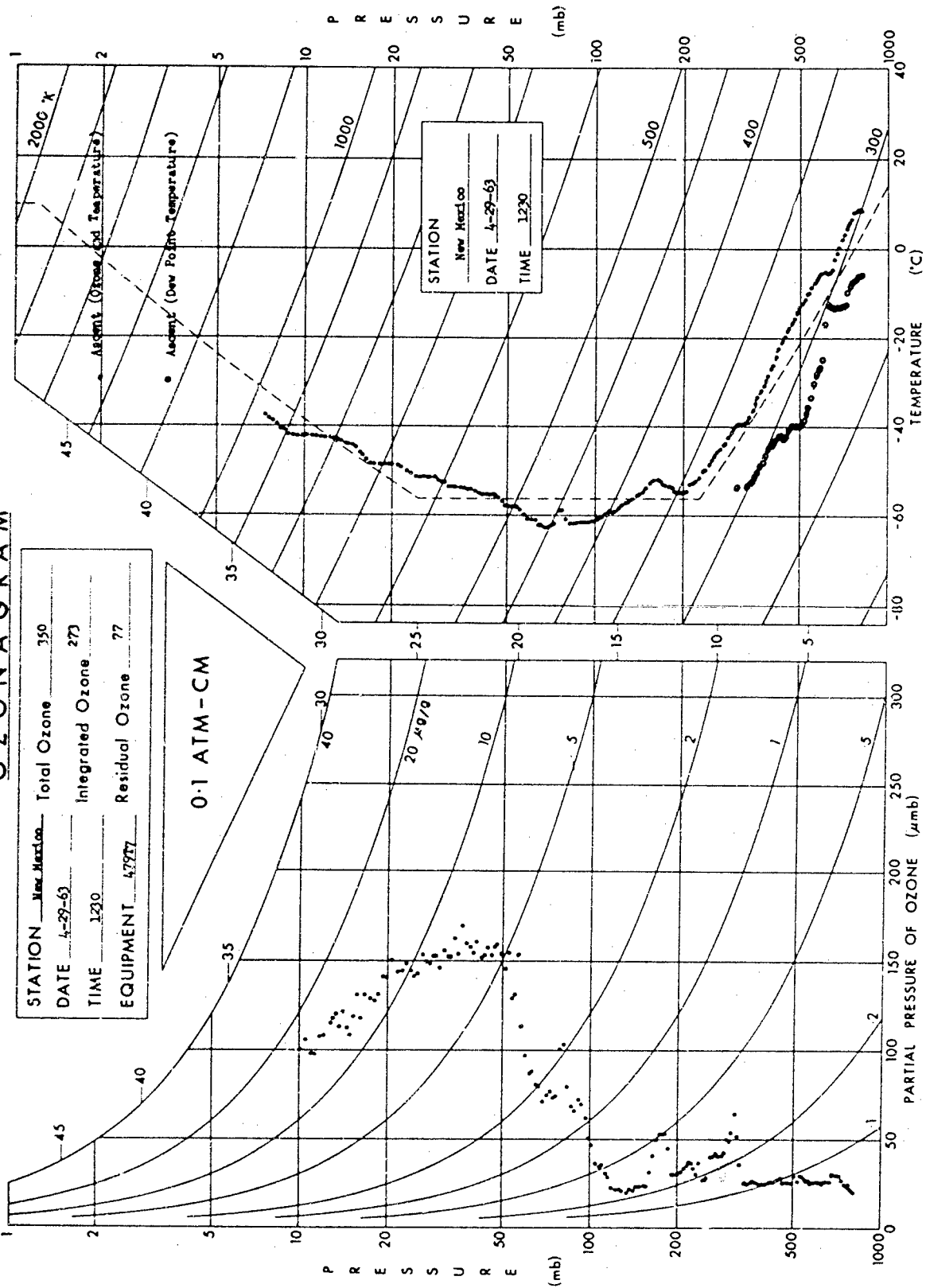
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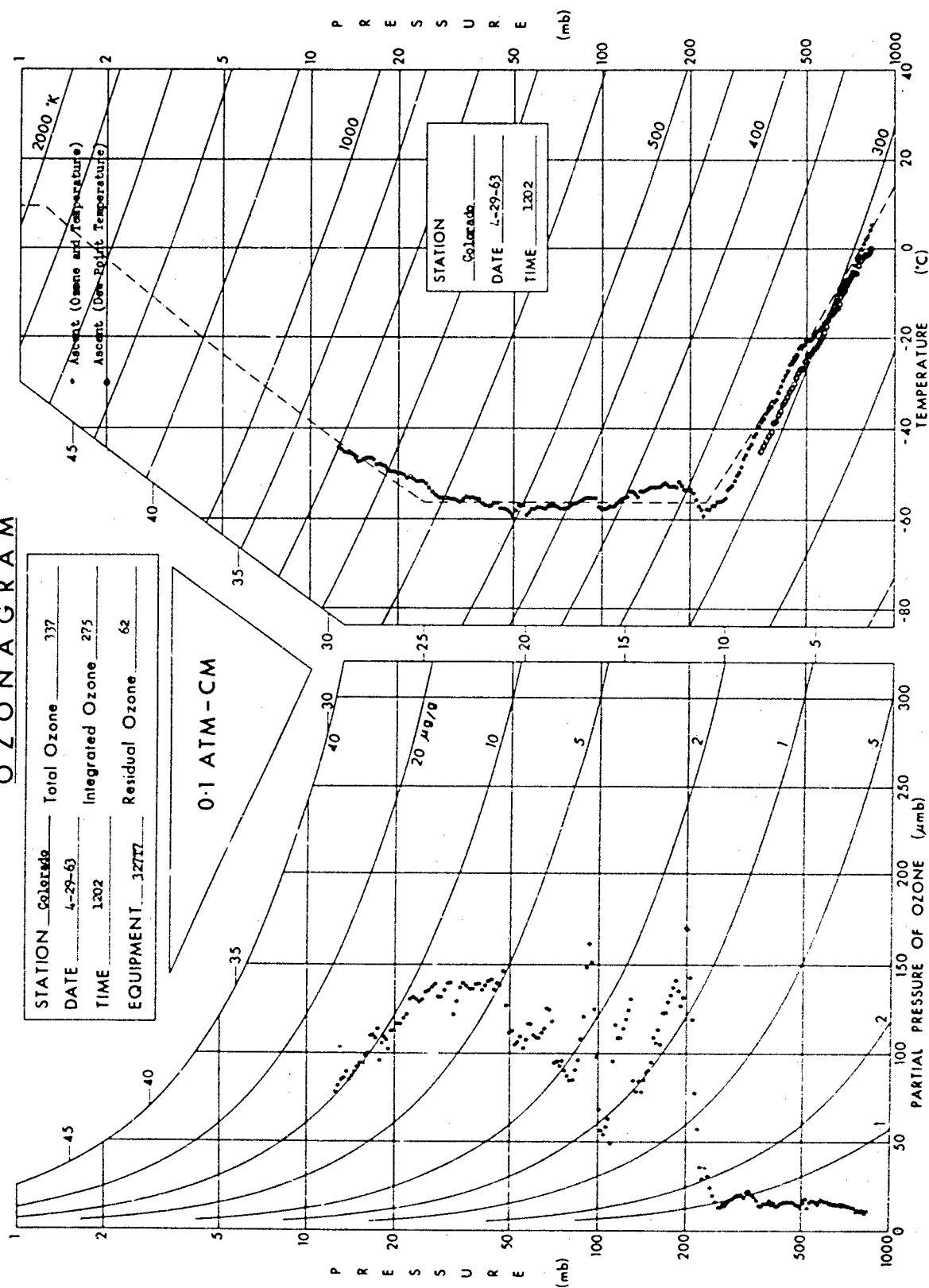
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STATION New Mexico Total Ozone 350  
 DATE 4-29-63 Integrated Ozone 273  
 TIME 1230 Residual Ozone 77  
 EQUIPMENT 47977

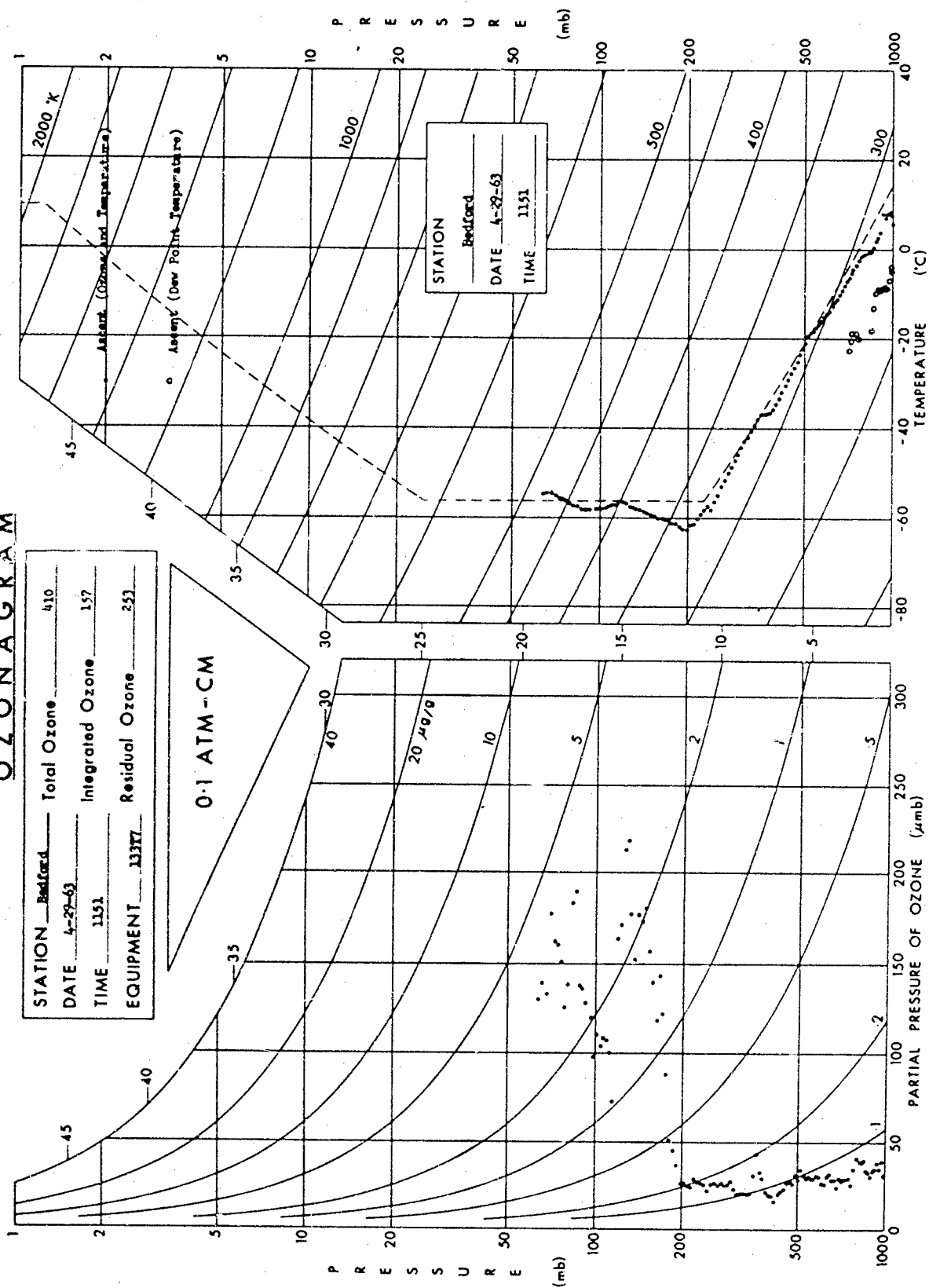
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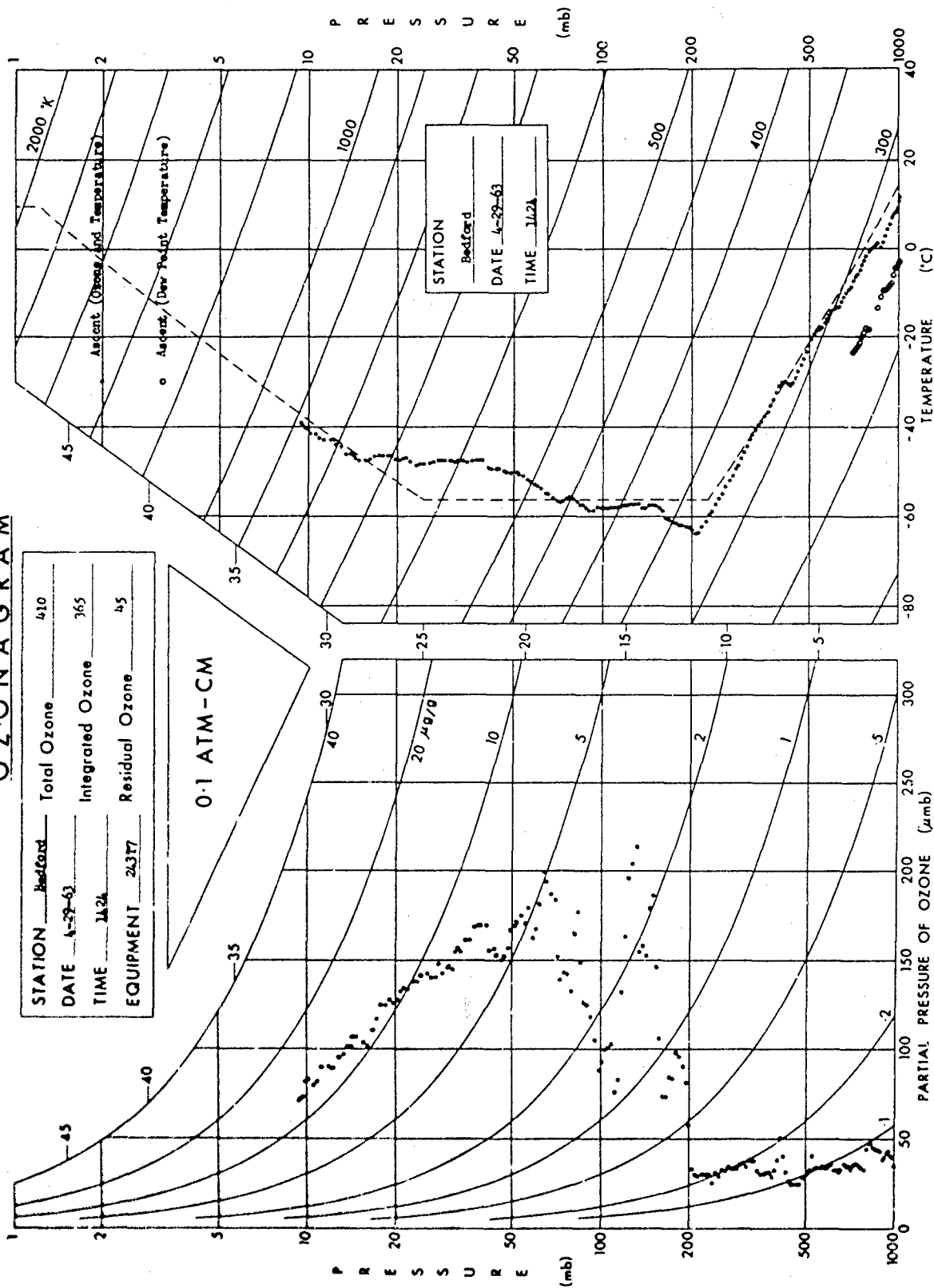
## OZONAGRAM



## OZONAGRAM

STATION Bedford Total Ozone 410  
 DATE 4-29-63 Integrated Ozone 365  
 TIME 1124 Residual Ozone 45  
 EQUIPMENT 24377

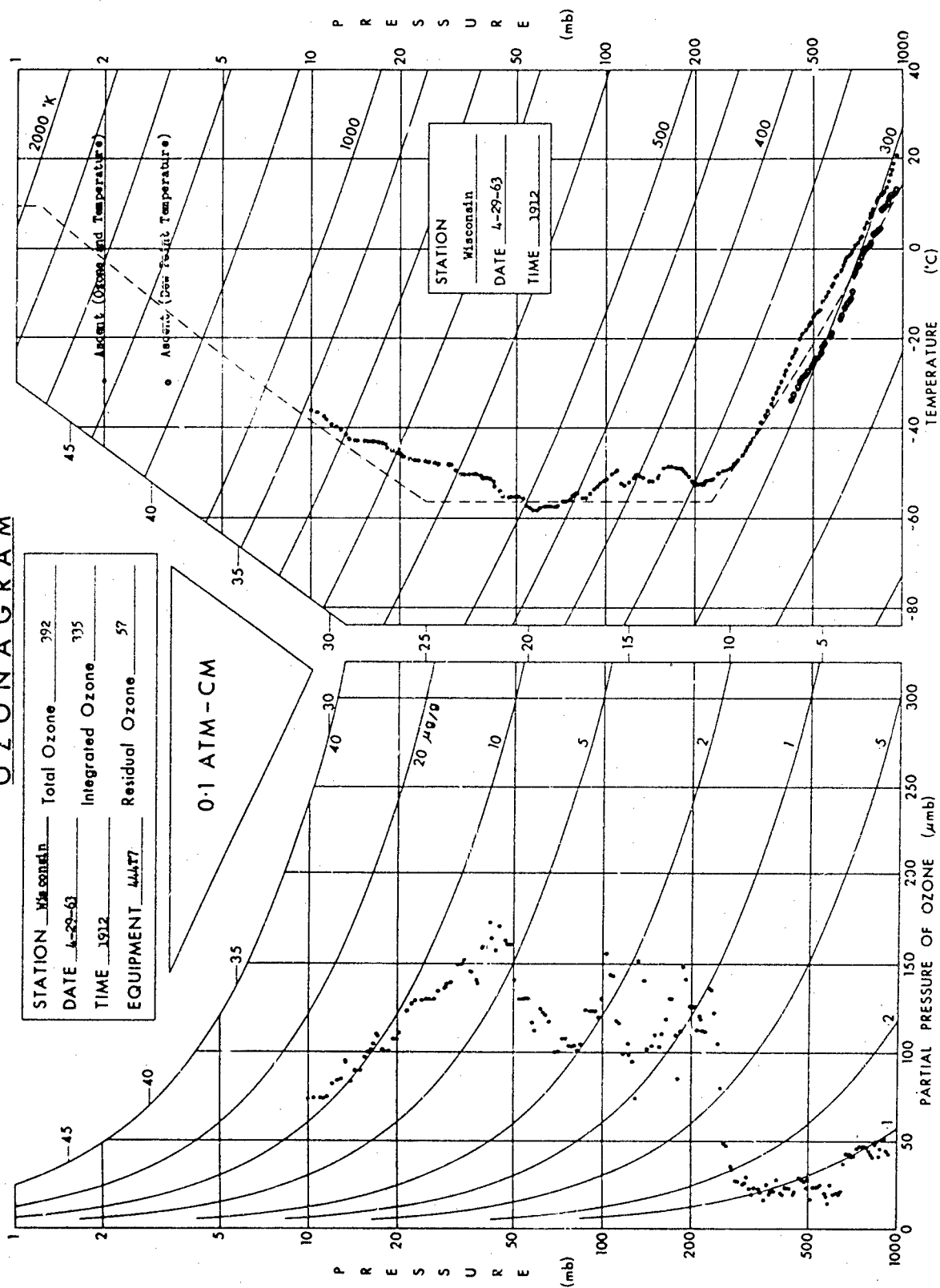
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## OZONAGRAM

STATION Wisconsin Total Ozone 392  
 DATE 4-29-63 Integrated Ozone 135  
 TIME 1912 Residual Ozone 57  
 EQUIPMENT 44477

0.1 ATM - CM

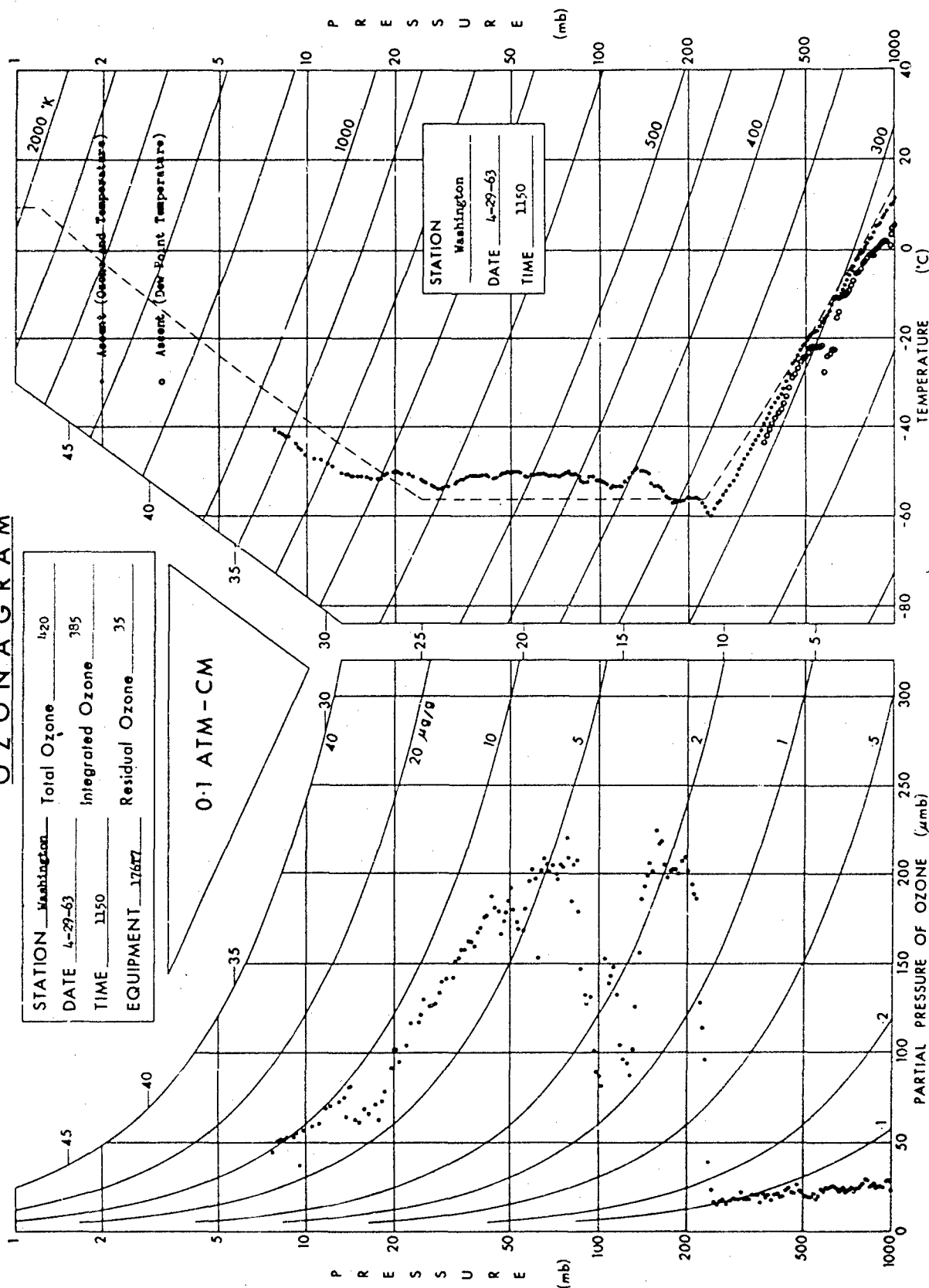




# OZONAGRAM

STATION	Washington	Total Ozone	1420
DATE	4-29-63	Integrated Ozone	385
TIME	1150	Residual Ozone	35
EQUIPMENT	1767		

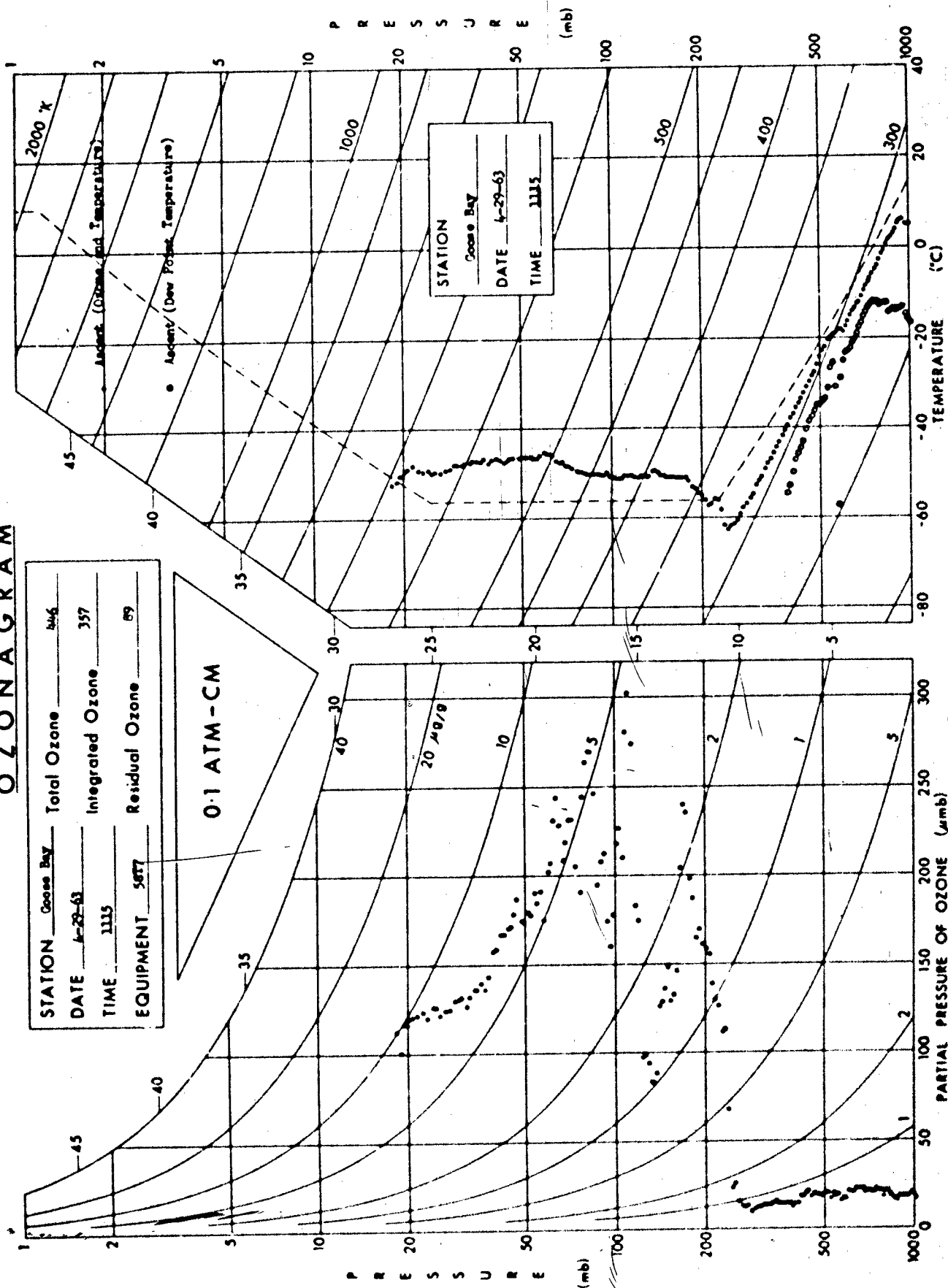
0.1 ATM-CM



## O Z O N A G R A M

STATION	Goose Bay	Total Ozone	446
DATE	4-29-63	Integrated Ozone	357
TIME	1115	Residual Ozone	89
EQUIPMENT	5877		

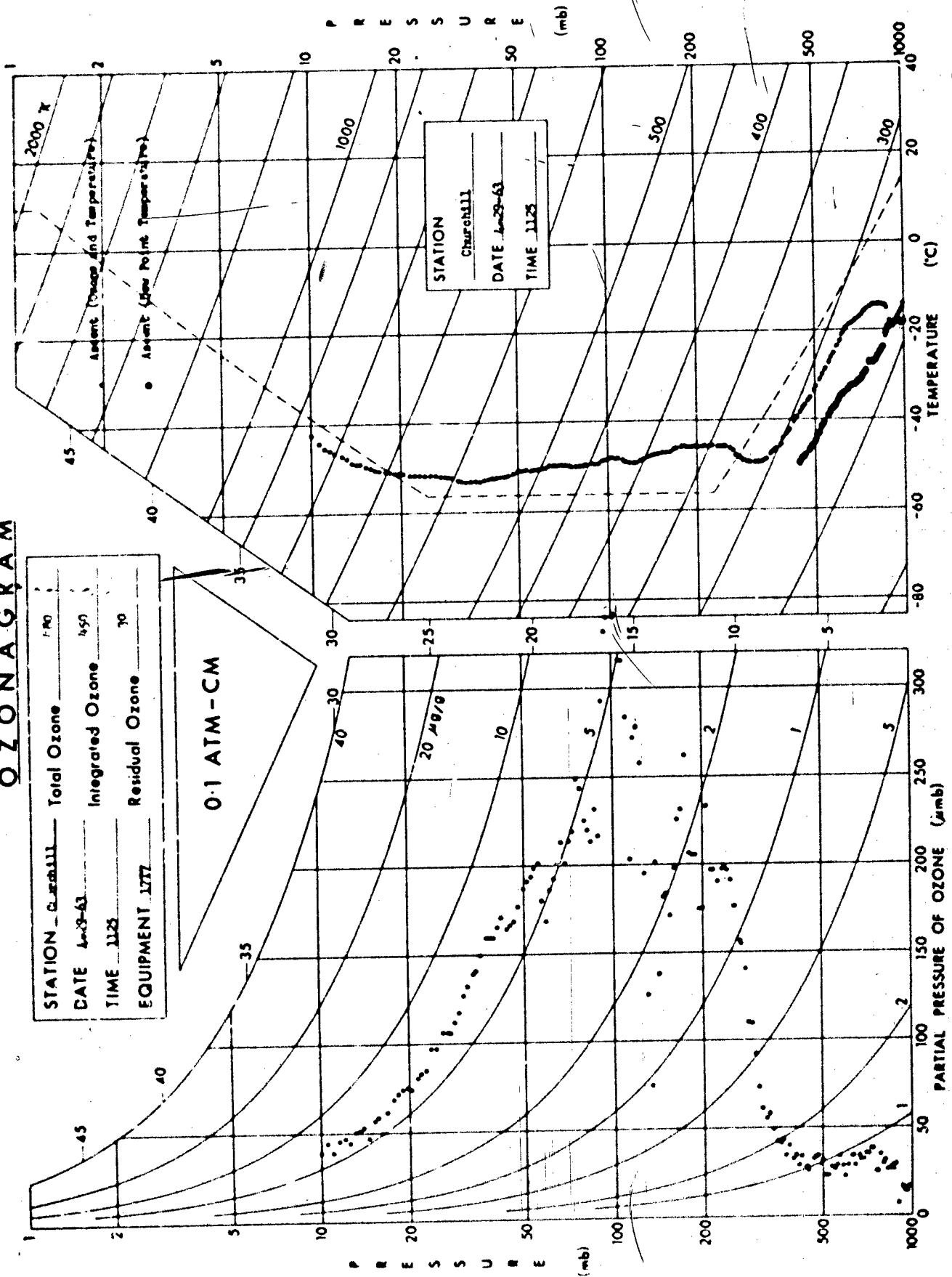
0.1 ATM-CM

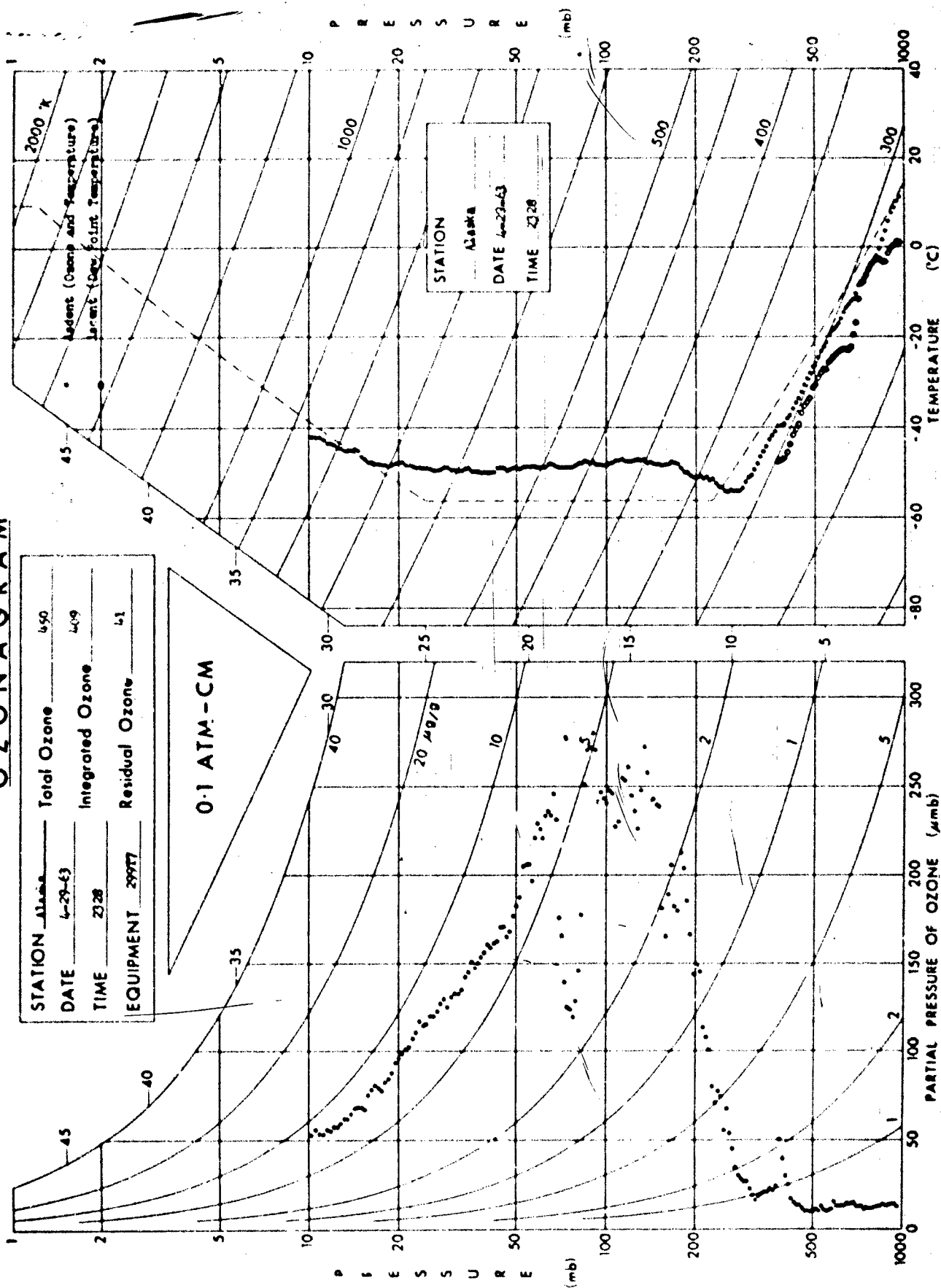


# OZONAGRAM

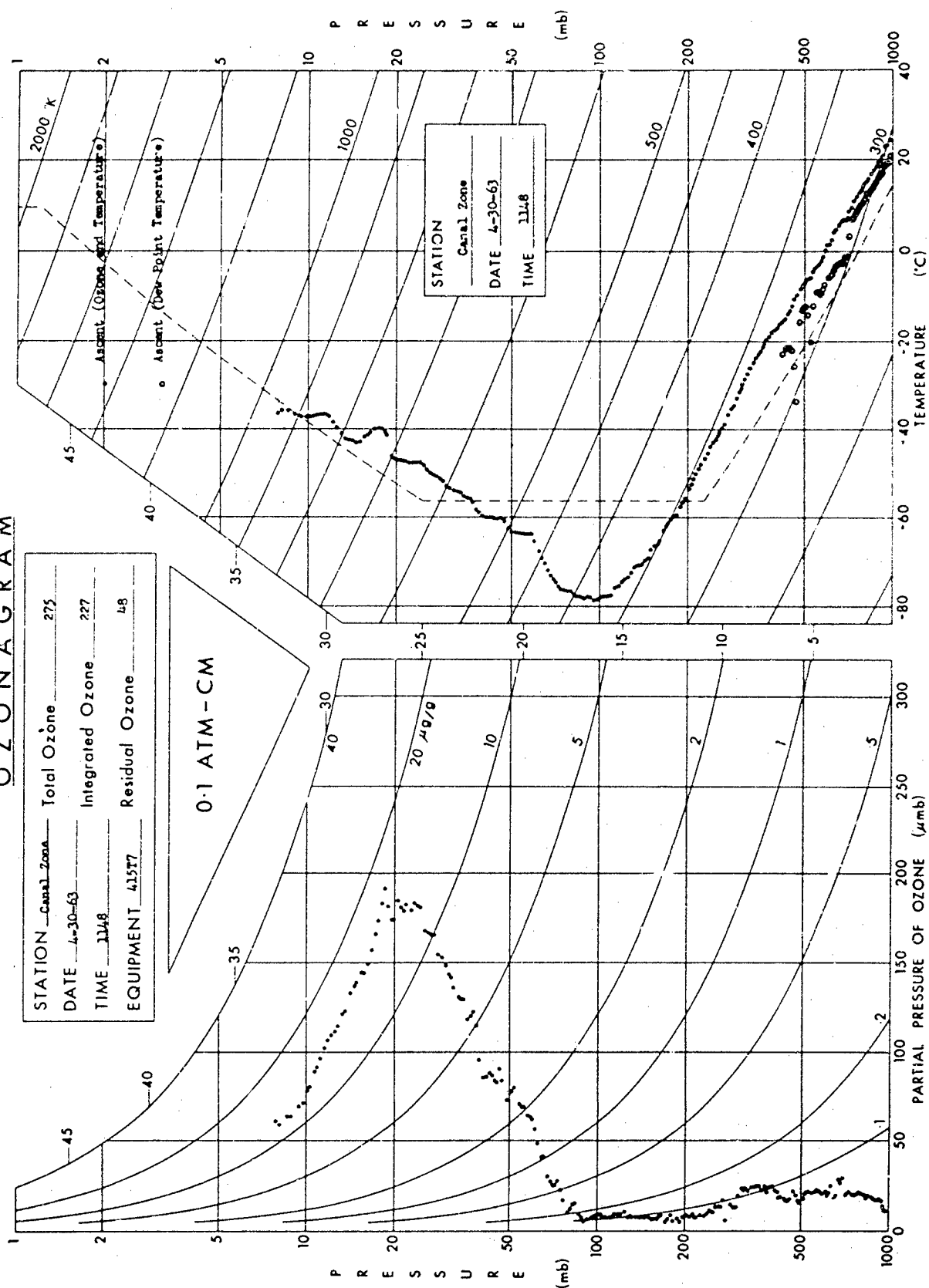
STATION <u>Chapin</u>	Total Ozone	140
DATE <u>4-29-63</u>	Integrated Ozone	450
TIME <u>1125</u>	Residual Ozone	70
EQUIPMENT <u>177</u>		

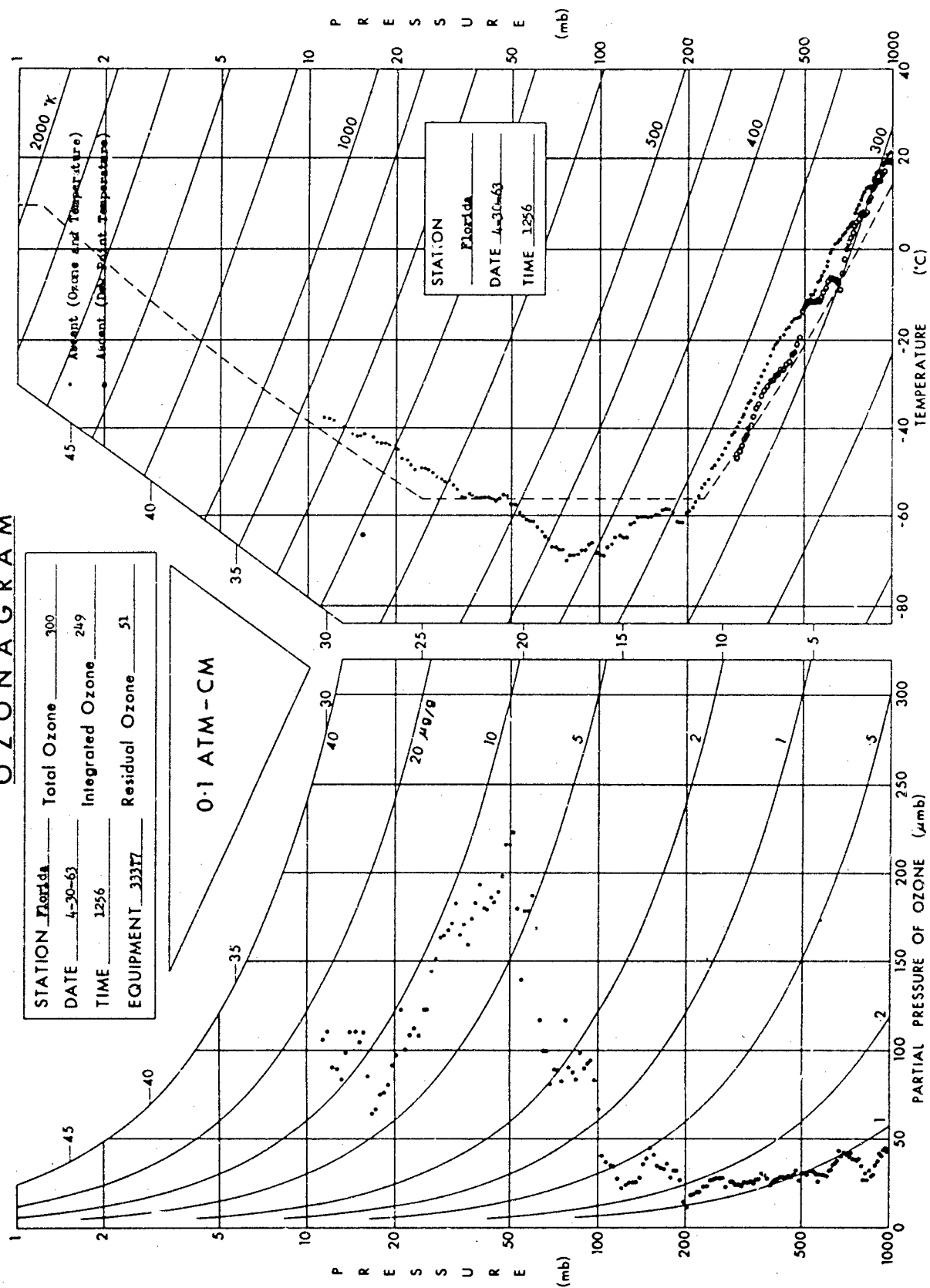
0.1 ATM-CM





# O Z O N A G R A M

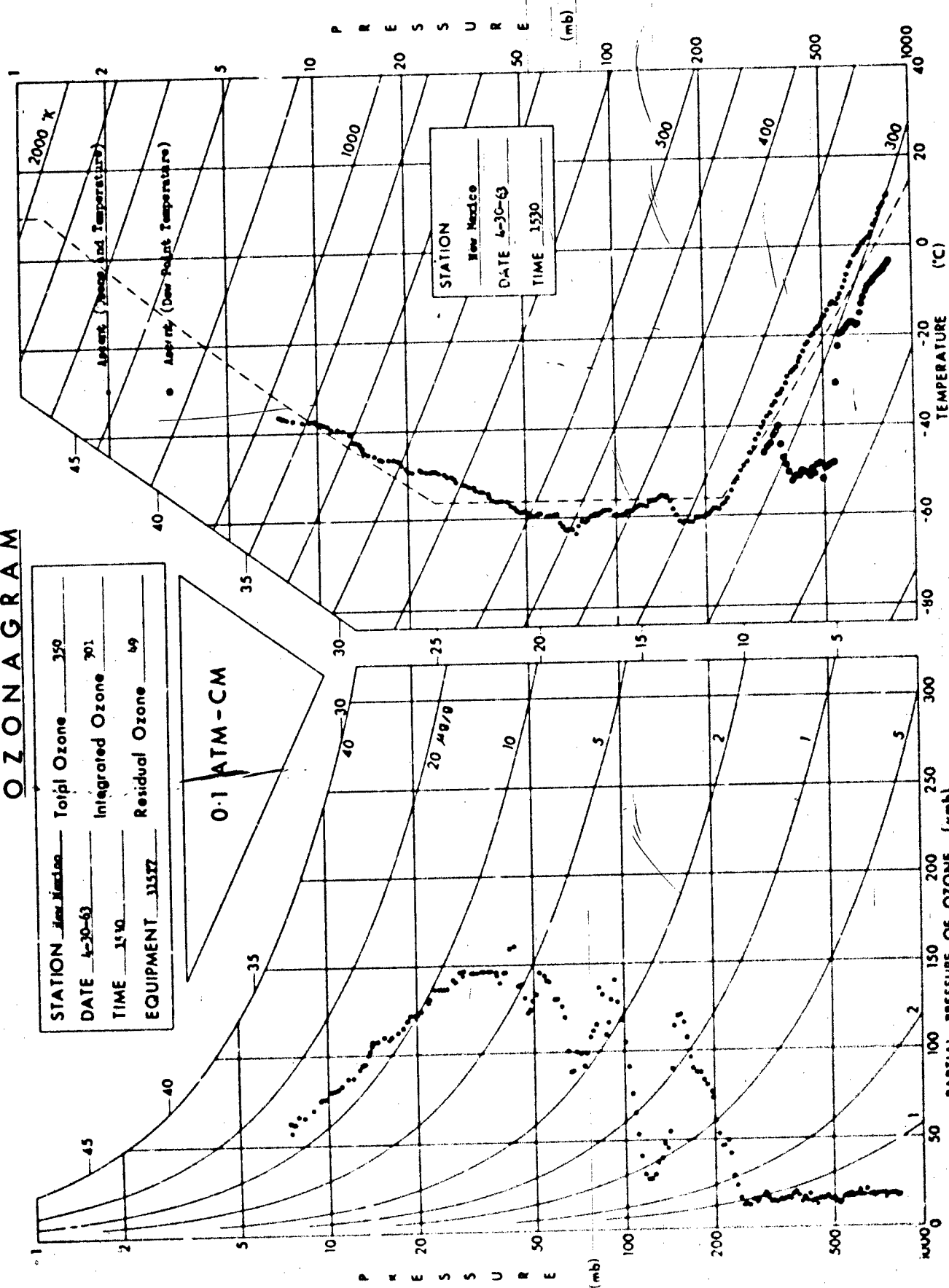




## O Z O N A G R A M

STATION	New Mexico	Total Ozone	350
DATE	4-30-63	Integrated Ozone	301
TIME	1510	Residual Ozone	69
EQUIPMENT	31517		

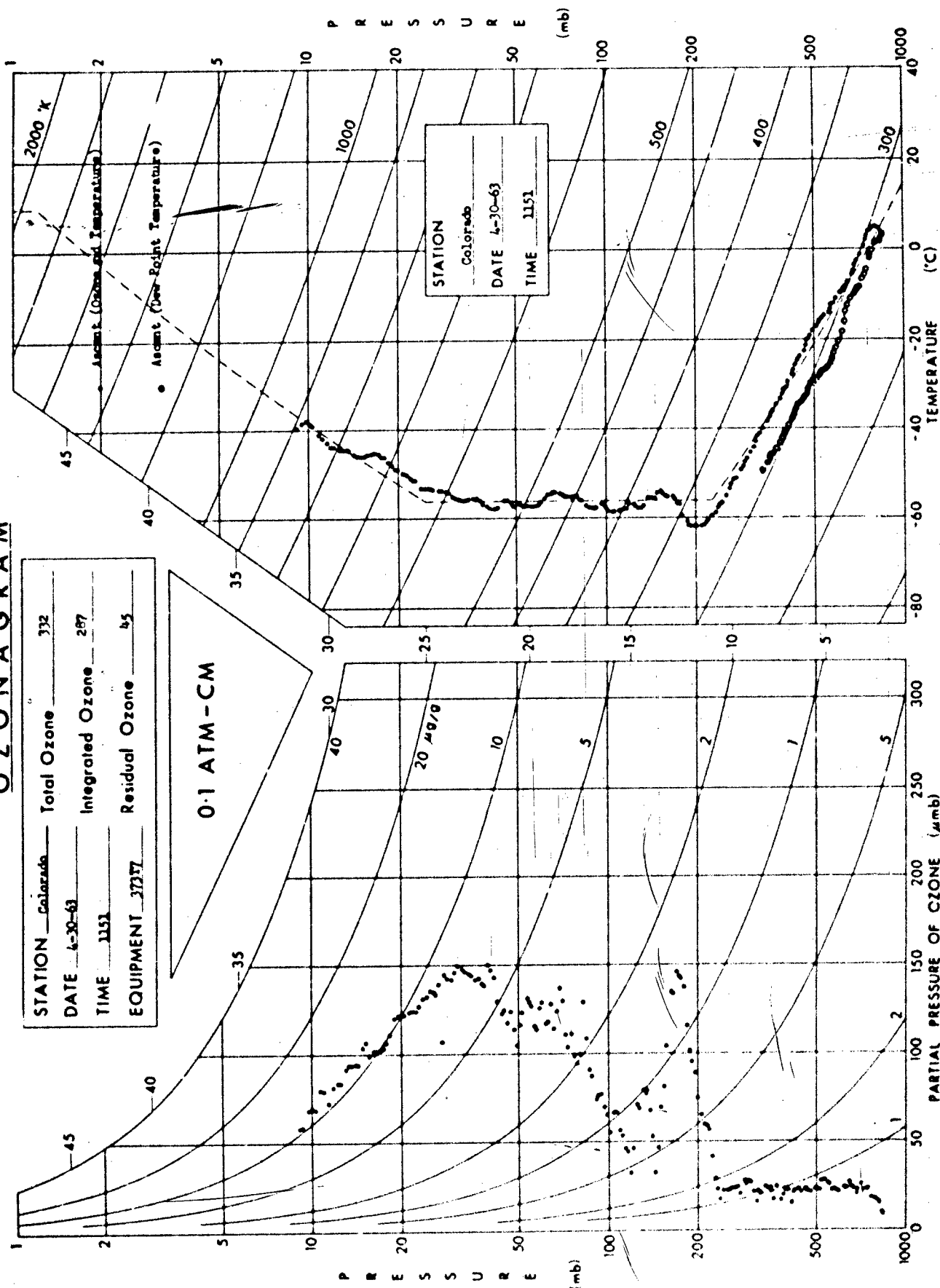
0.1 ATM-CM



## O Z O N A G R A M

STATION Colorado Total Ozone 332  
 DATE 4-30-63 Integrated Ozone 287  
 TIME 1151 Residual Ozone 45  
 EQUIPMENT 3737

0.1 ATM-CM

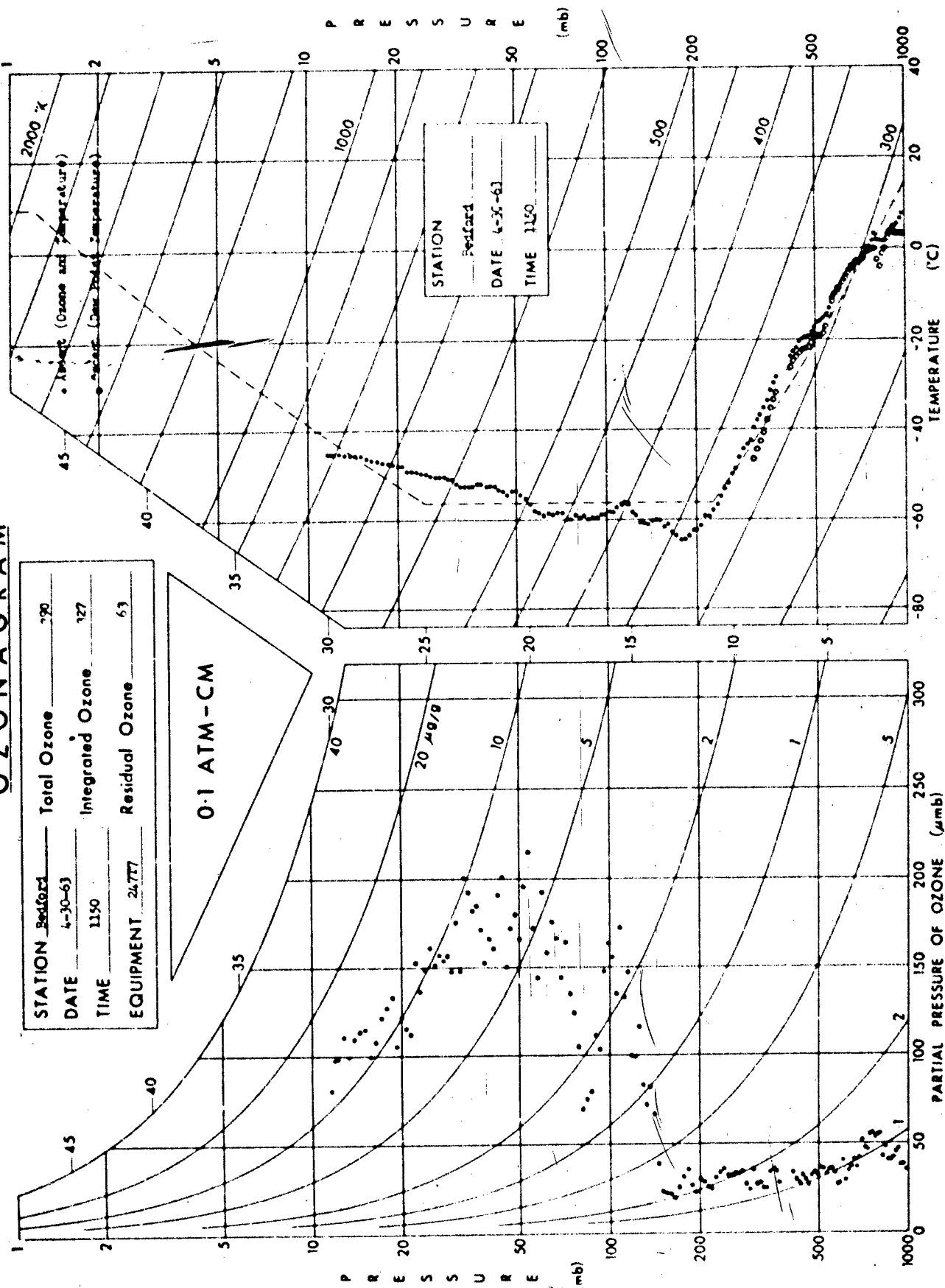




## O Z O N A G R A M

STATION	Bedford	Total Ozone	390
DATE	4-30-63	Integrated Ozone	127
TIME	1150	Residual Ozone	63
EQUIPMENT	24777		

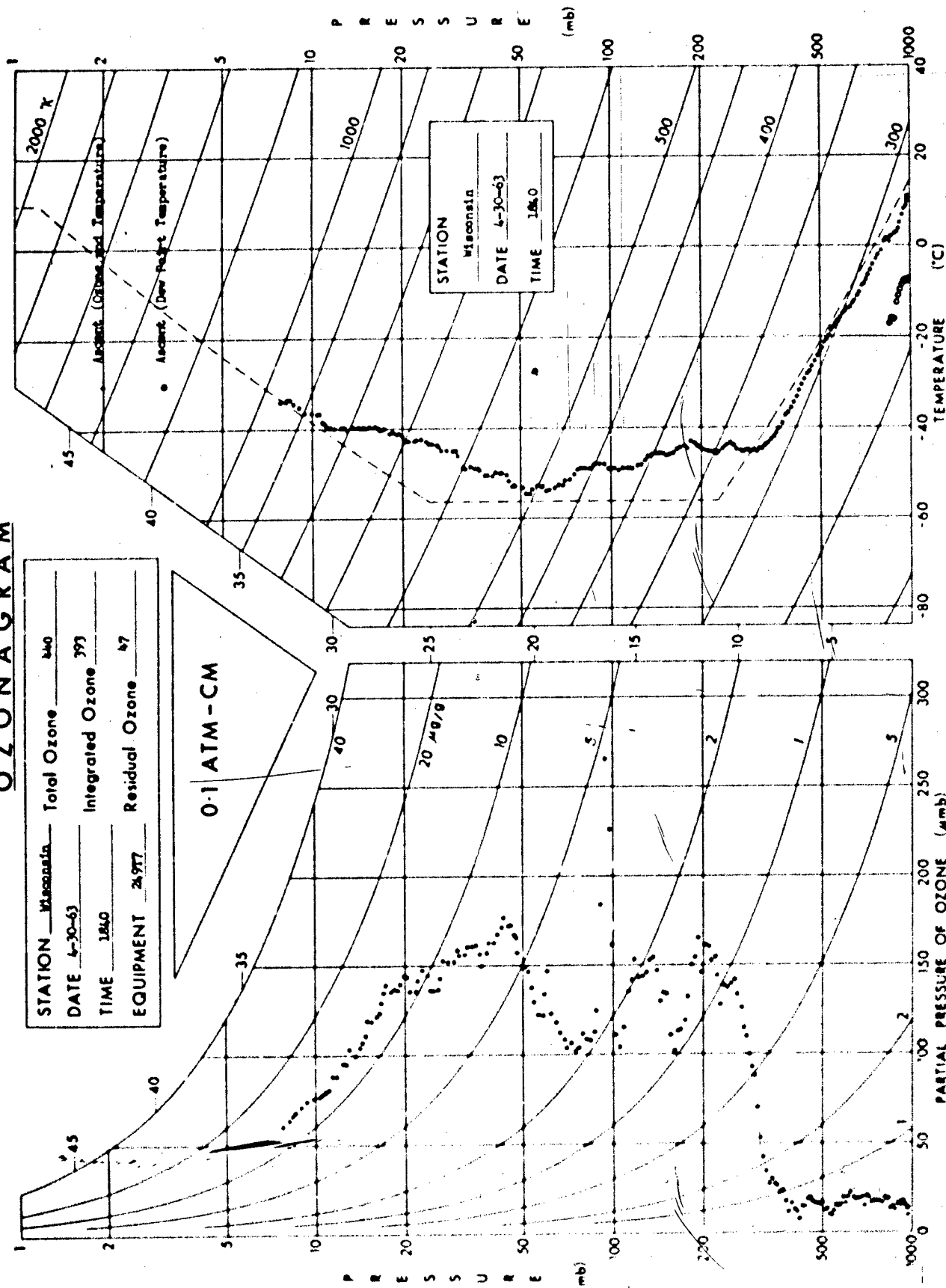
0.1 ATM-CM



# OZONAGRAM

STATION Wisconsin Total Ozone 440  
 DATE 4-30-63 Integrated Ozone 793  
 TIME 1840 Residual Ozone 47  
 EQUIPMENT 24977

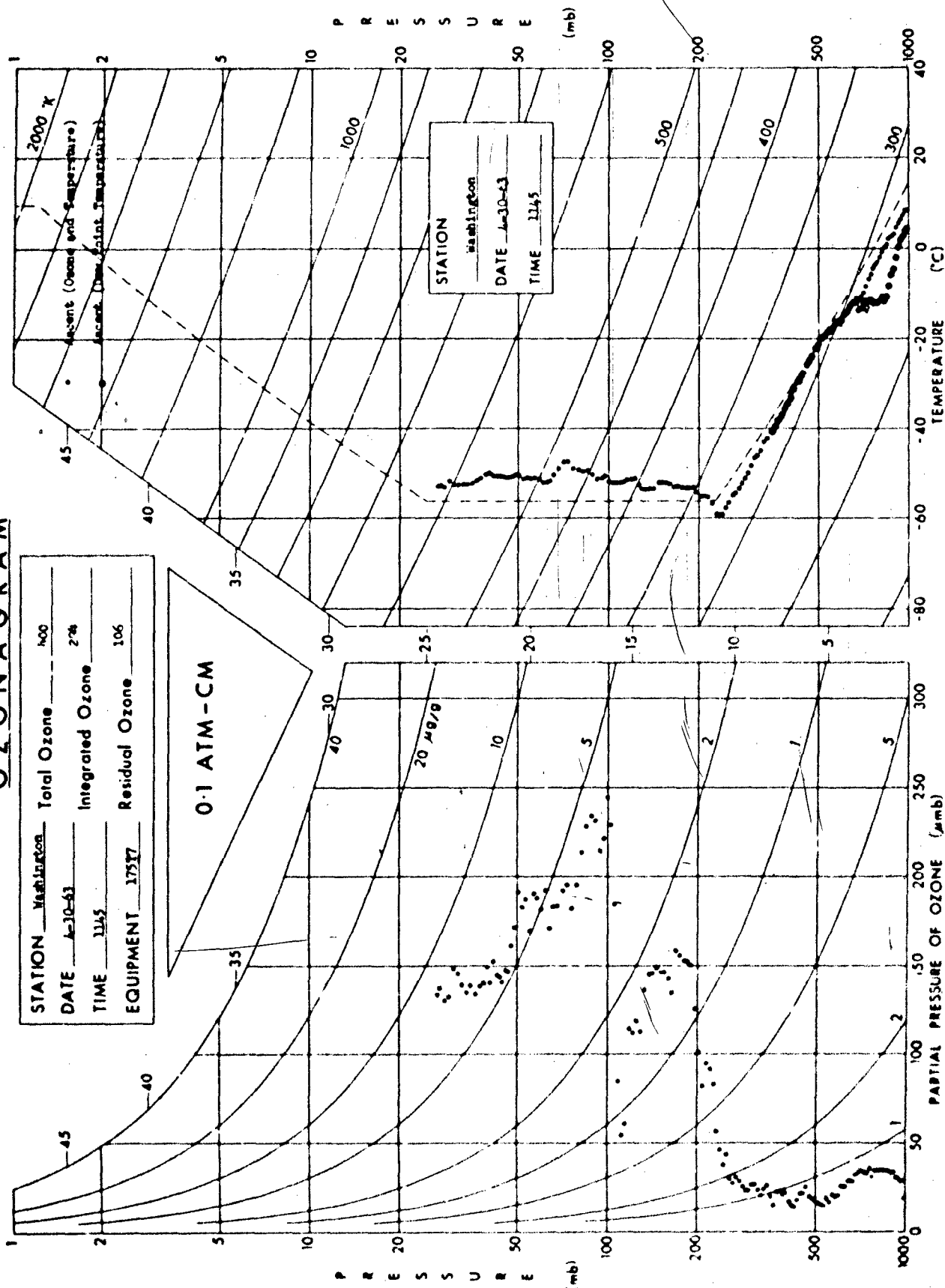
0.1 ATM-CM

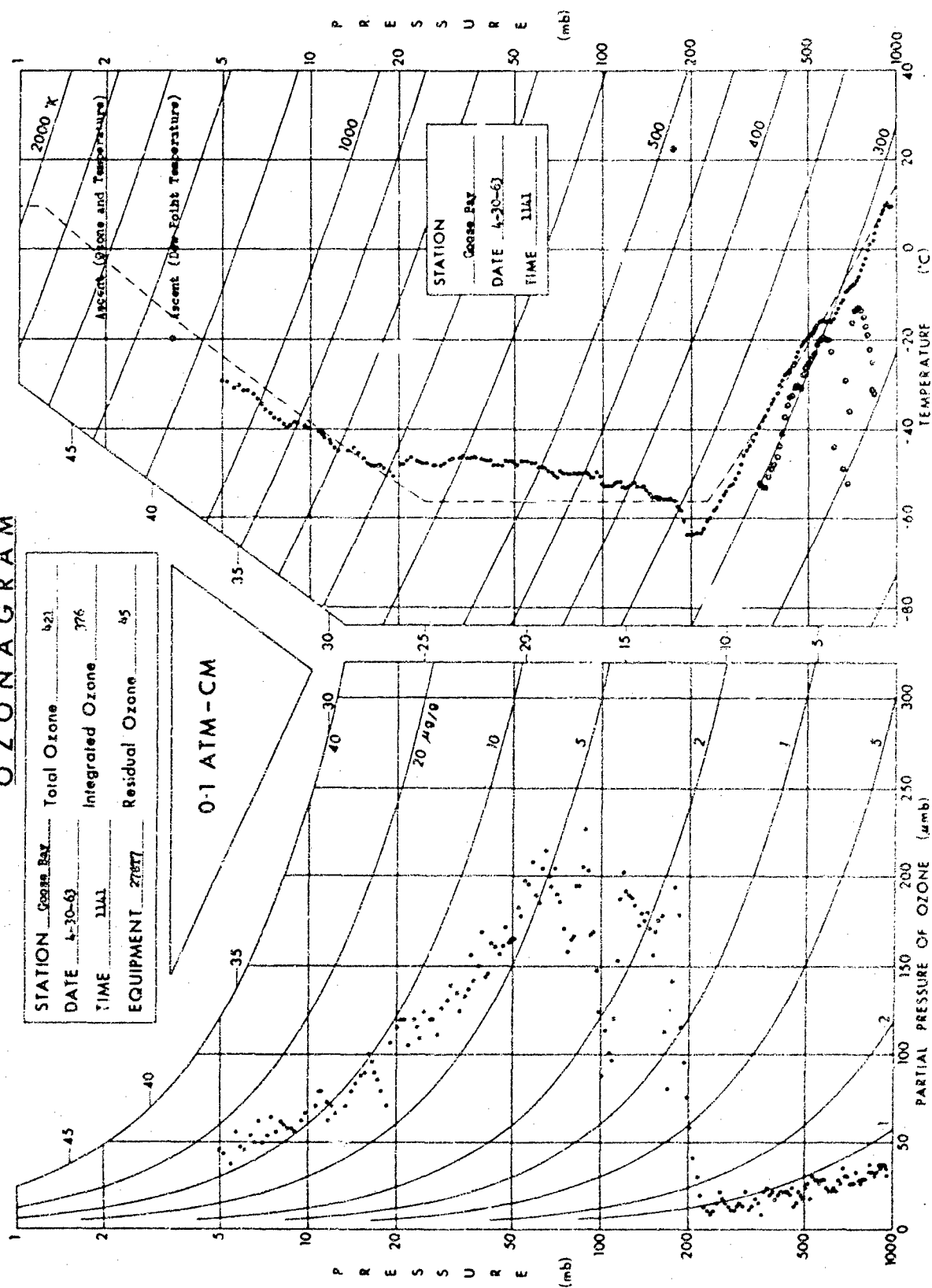


# OZONAGRAM

STATION Washington Total Ozone 400  
 DATE 4-30-43 Integrated Ozone 2%  
 TIME 1145 Residual Ozone 106  
 EQUIPMENT 17517

0.1 ATM-CM

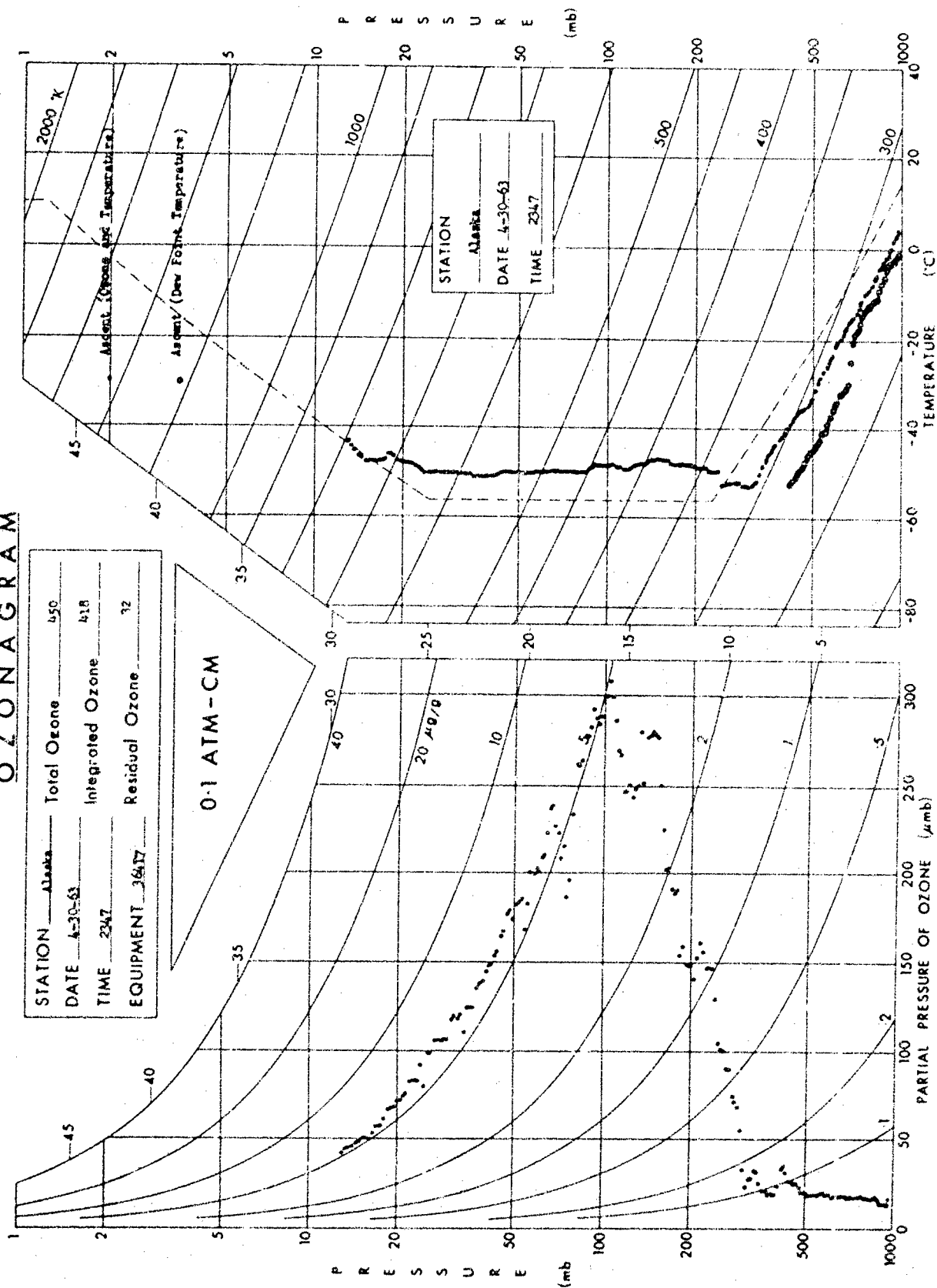




## O Z O N A G R A M

STATION	Alaska	Total Ozone	450
DATE	4-30-63	Integrated Ozone	418
TIME	2347	Residual Ozone	32
EQUIPMENT	3617		

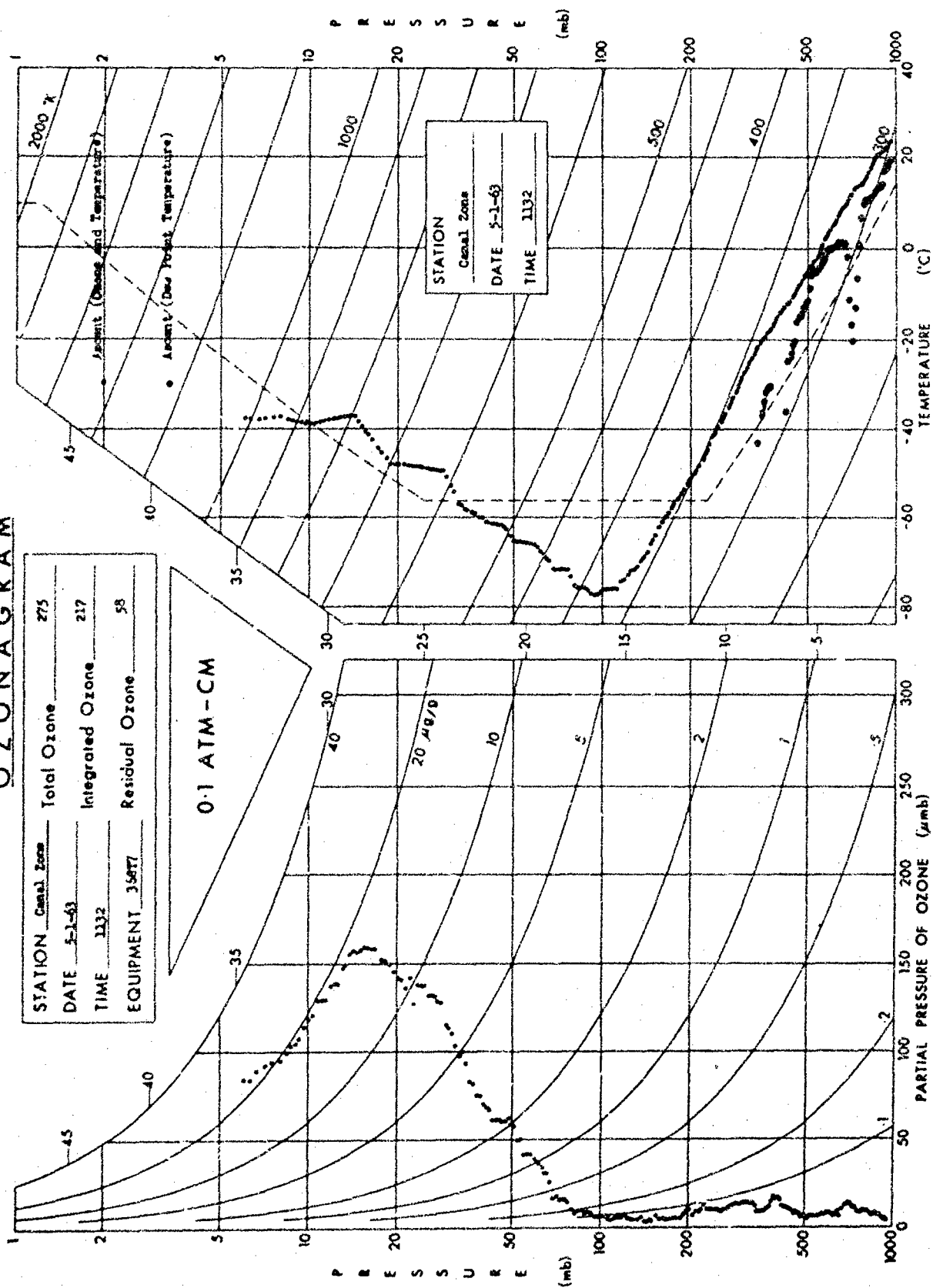
0.1 ATM-CM



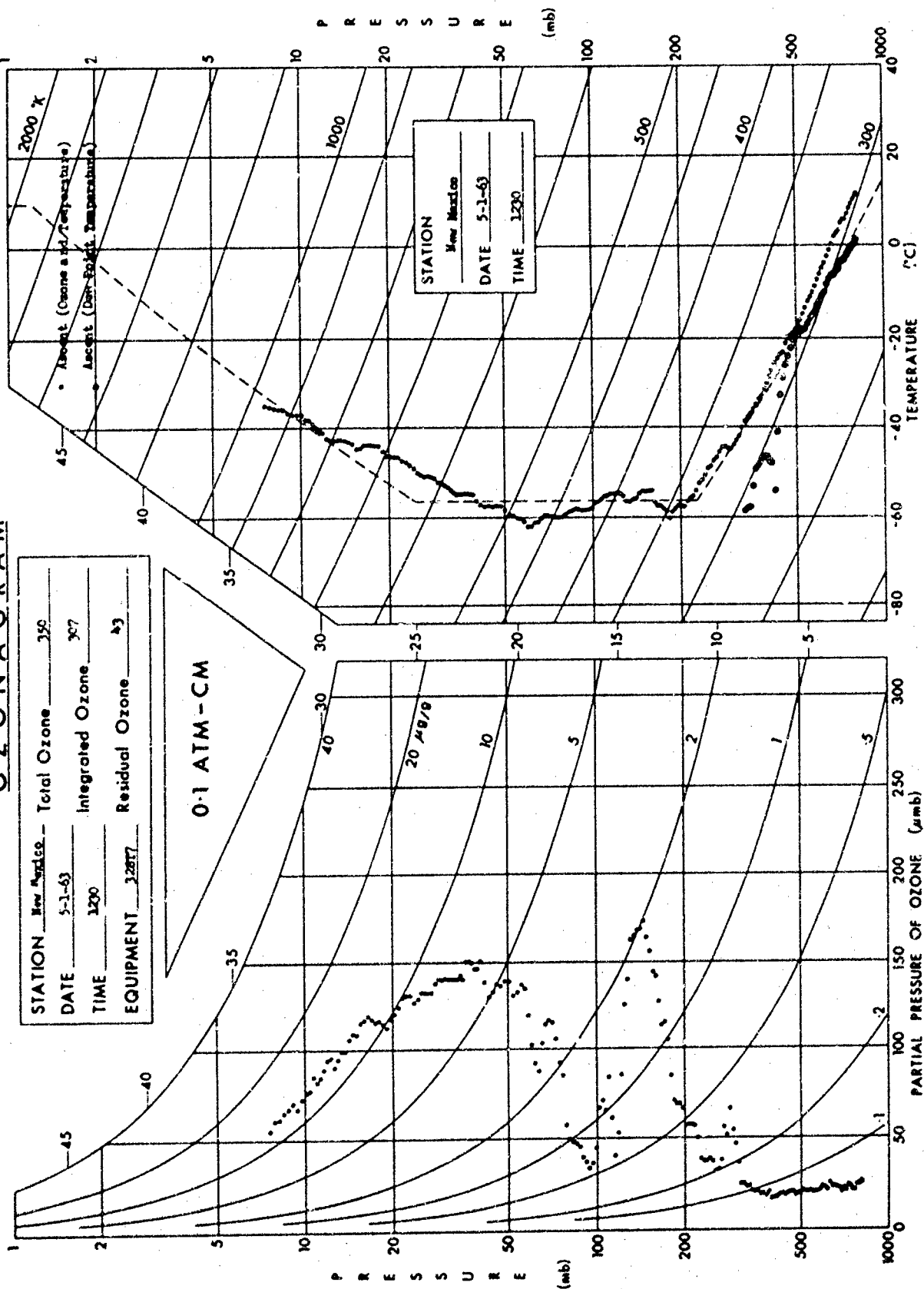
## O Z O N A G R A M

STATION	Canal Zone	Total Ozone	275
DATE	5-1-63	Integrated Ozone	217
TIME	1132	Residual Ozone	58
EQUIPMENT	35877		

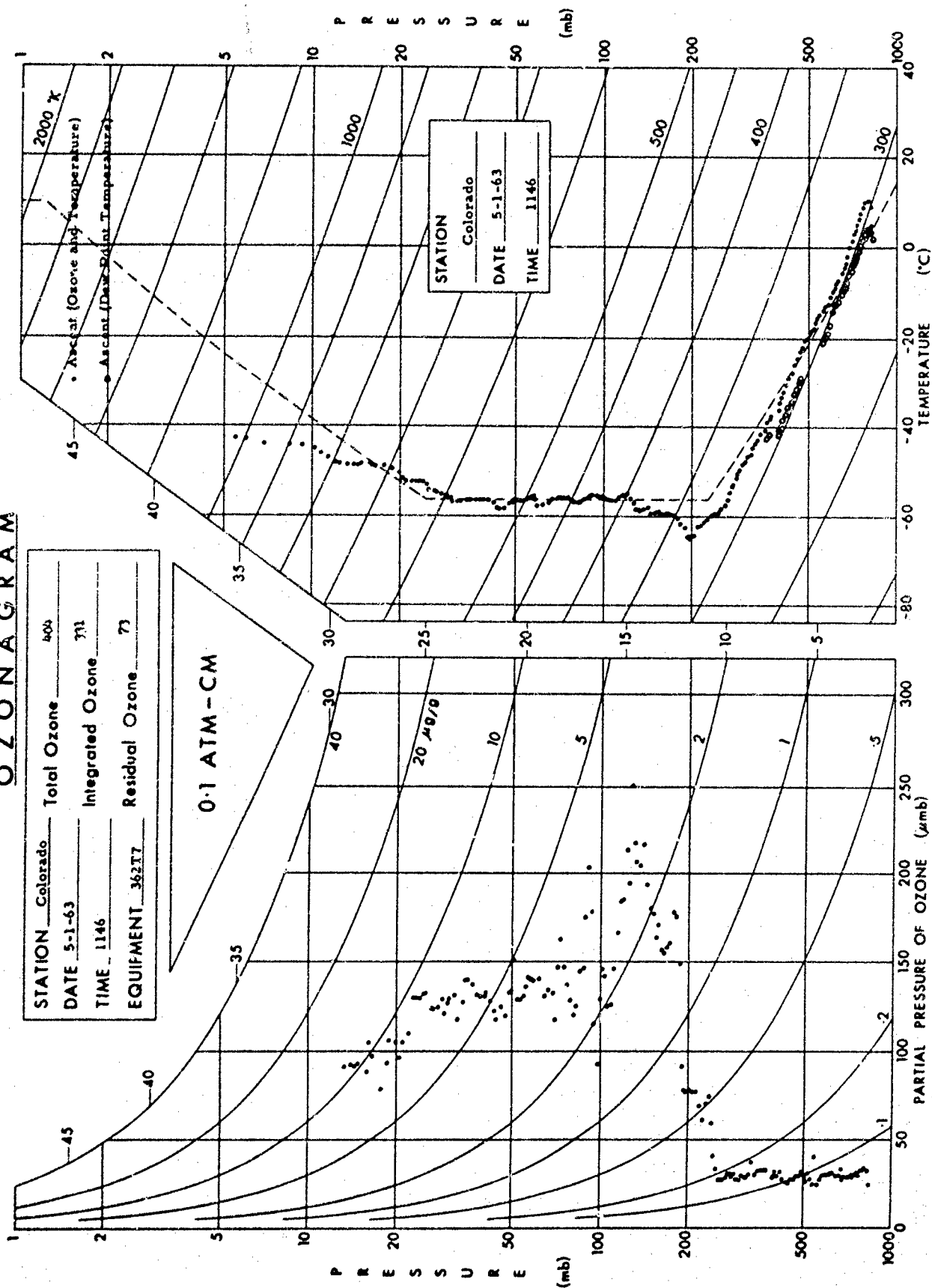
0.1 ATM-CM



## O Z O N A G R A M

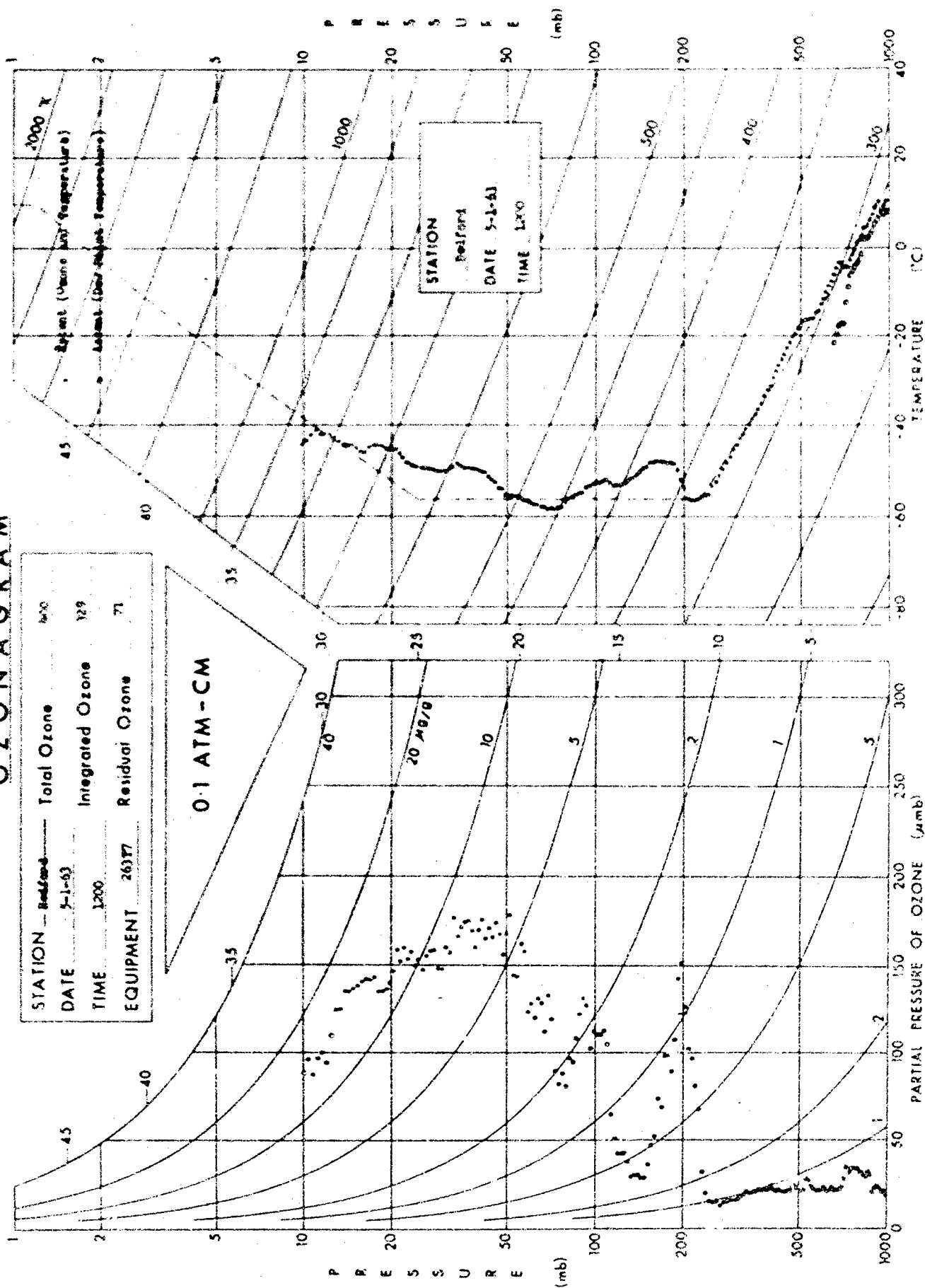


## O Z O N A G R A M





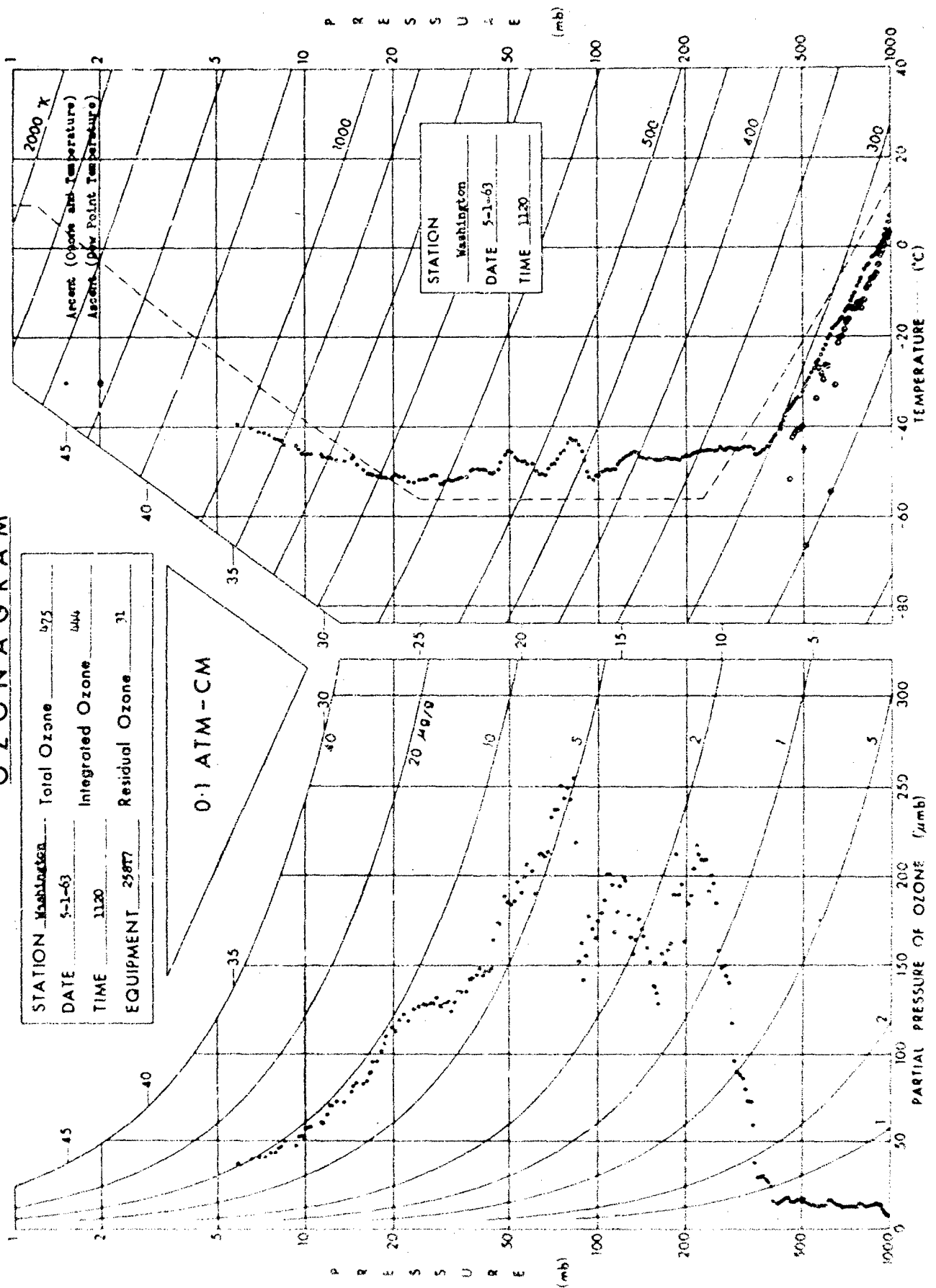
## O Z O N A G R A M



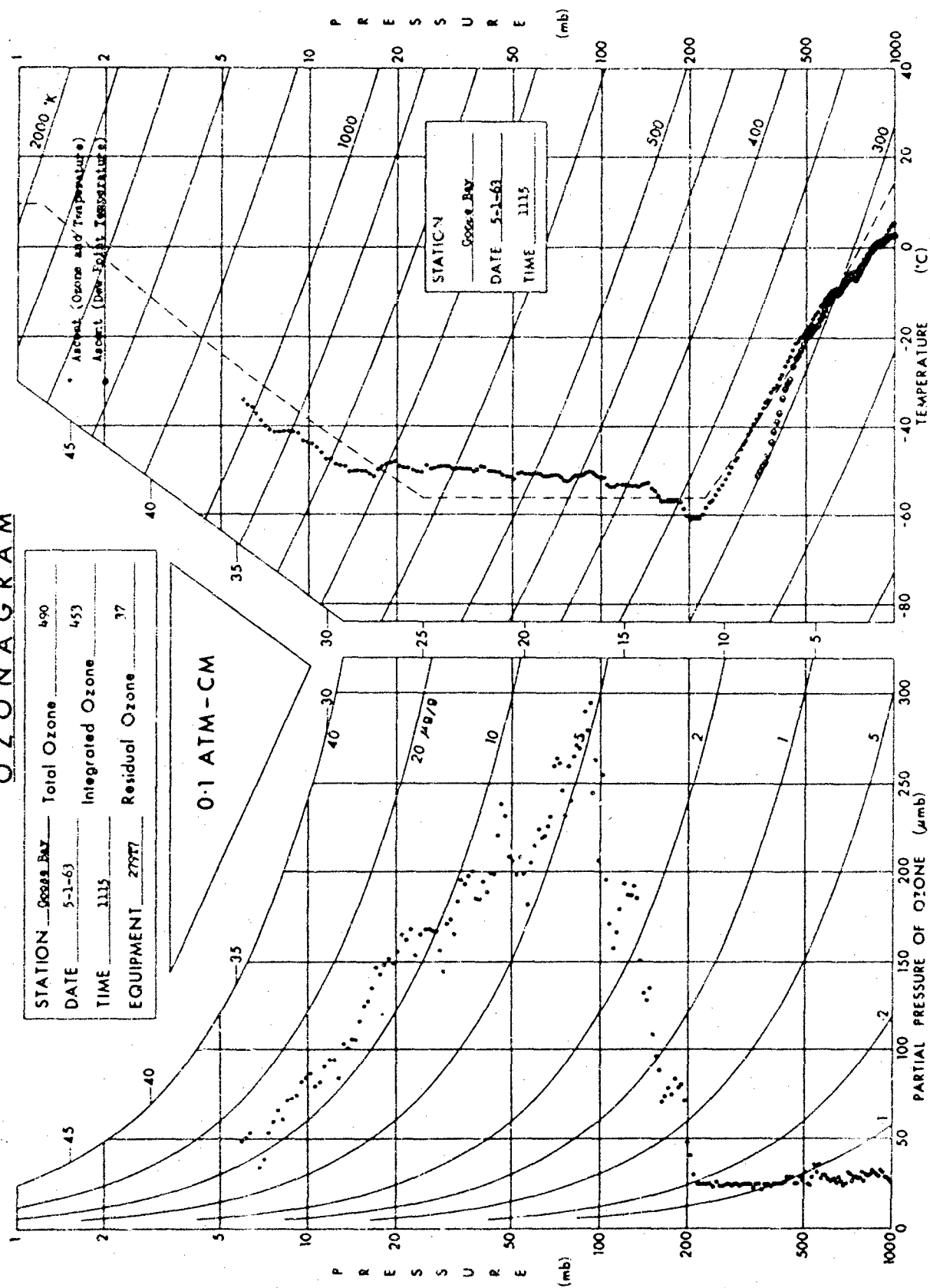
## O Z O N A G R A M

STATION Washington Total Ozone 675  
 DATE 5-1-63 Integrated Ozone 644  
 TIME 1120 Residual Ozone 31  
 EQUIPMENT 25877

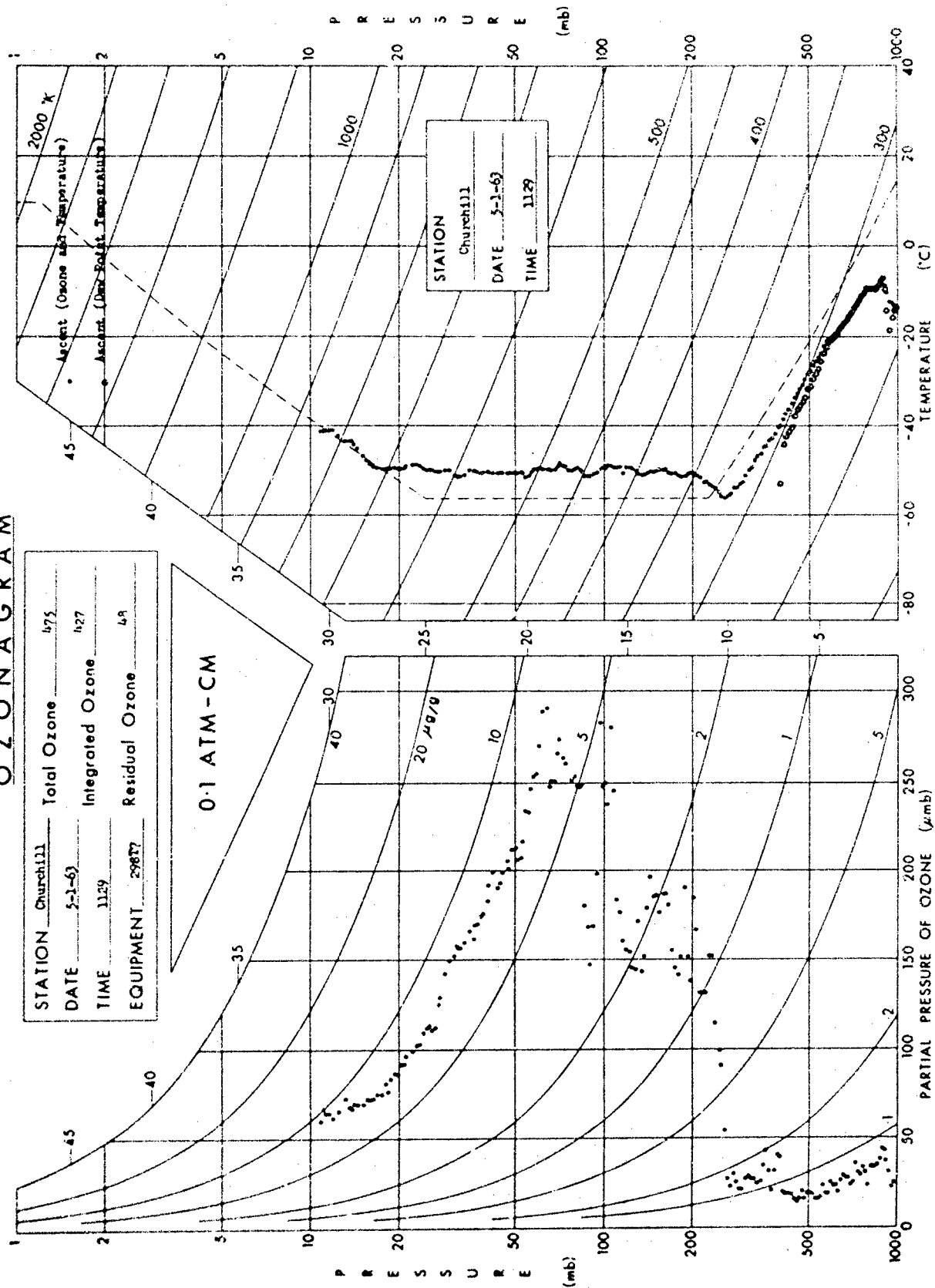
0.1 ATM - CM



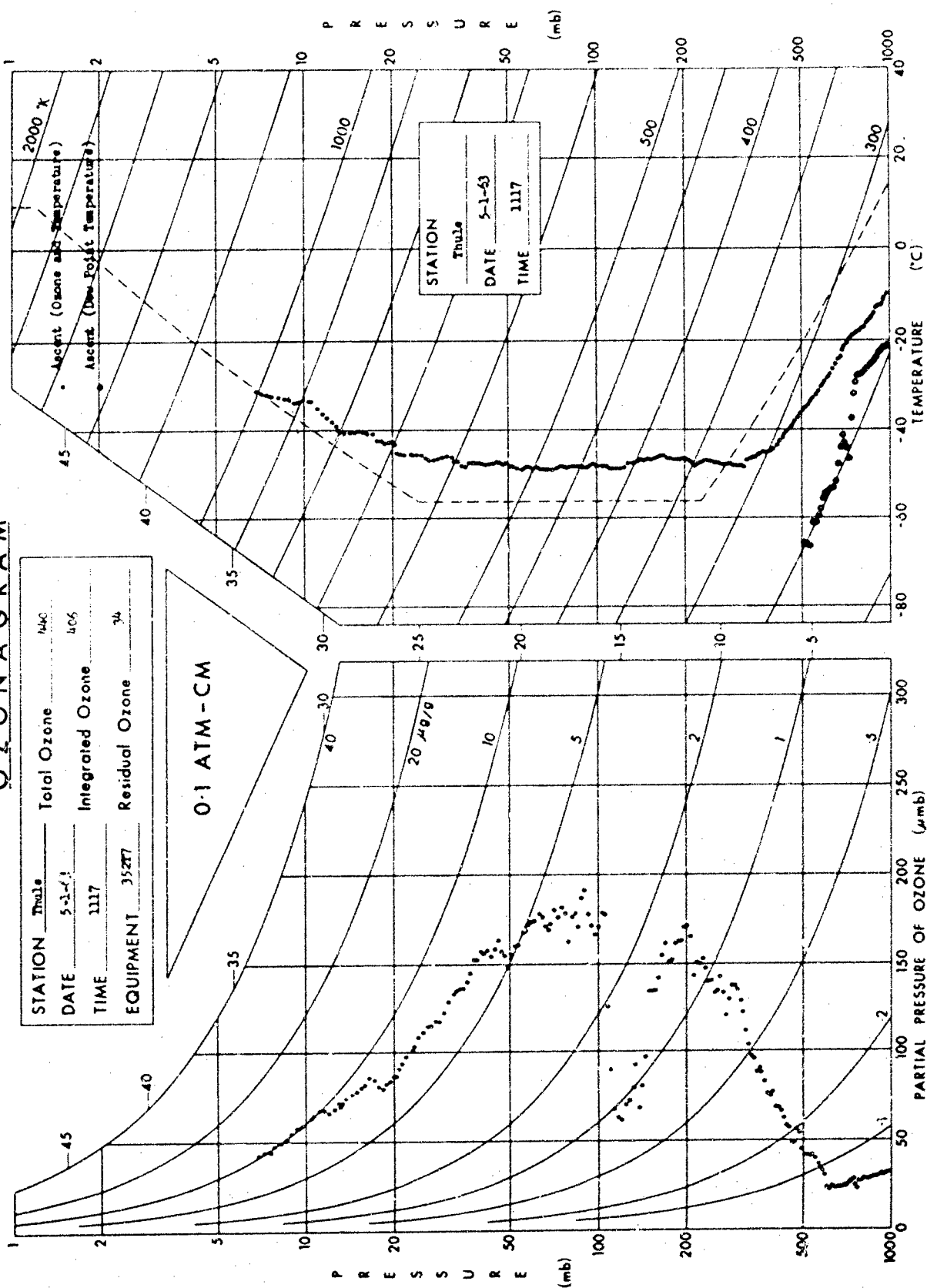
## OZONAGRAM



## O Z O N A G R A M



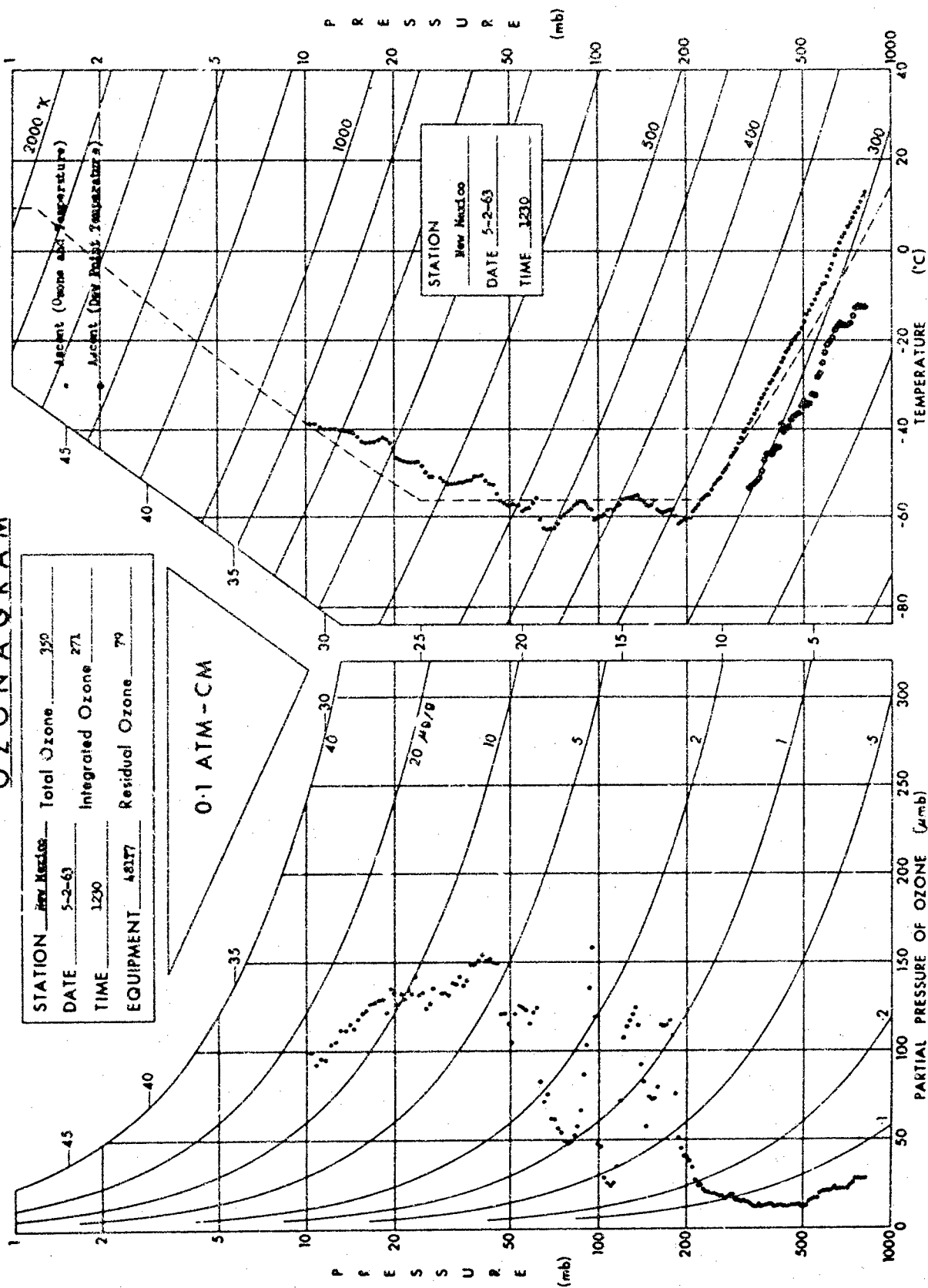
## OZONAGRAM



# OZONAGRAM

STATION	New Mexico	Total Ozone	350
DATE	5-2-63	Integrated Ozone	271
TIME	1230	Residual Ozone	79
EQUIPMENT	48177		

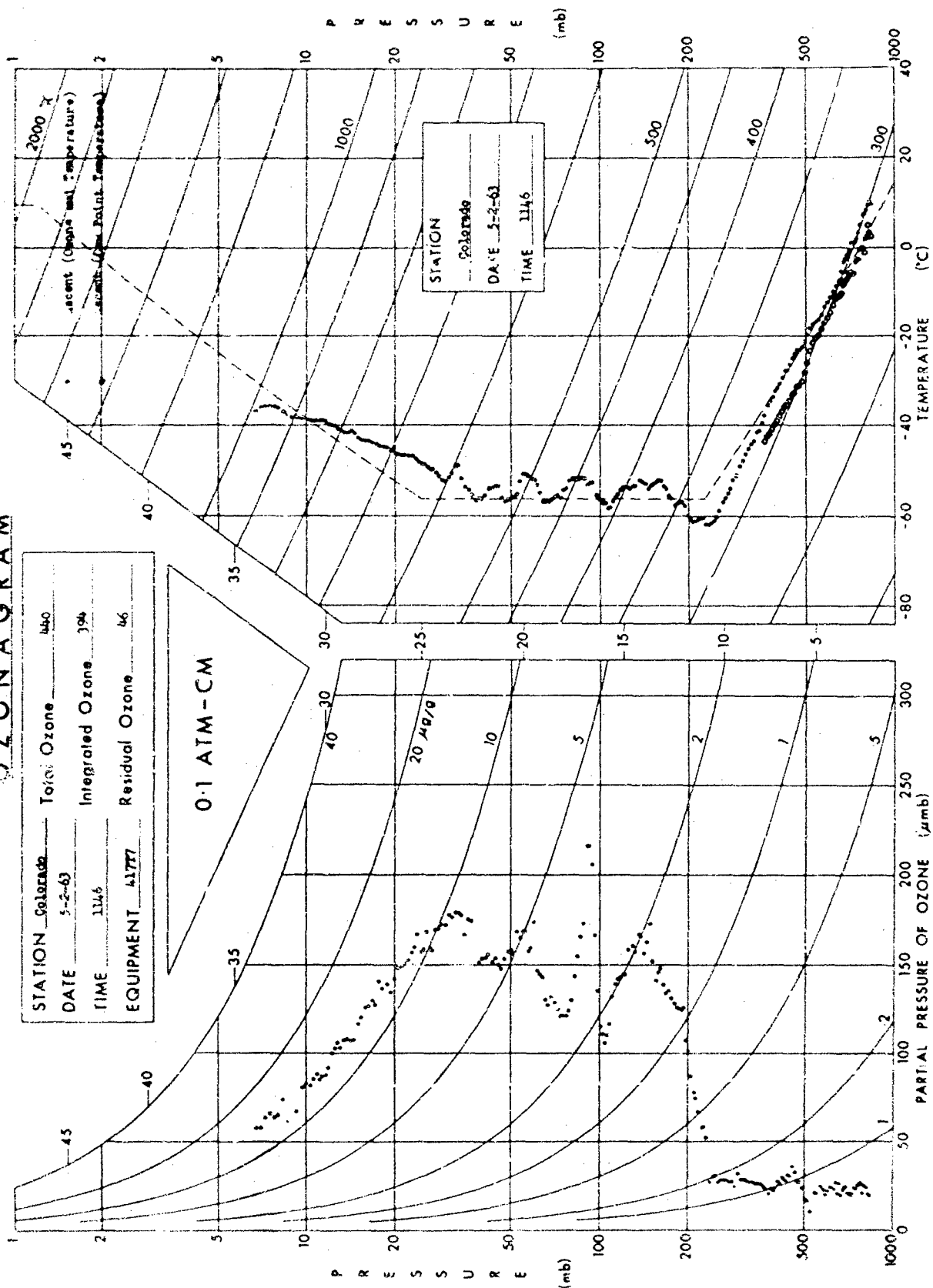
0.1 ATM-CM



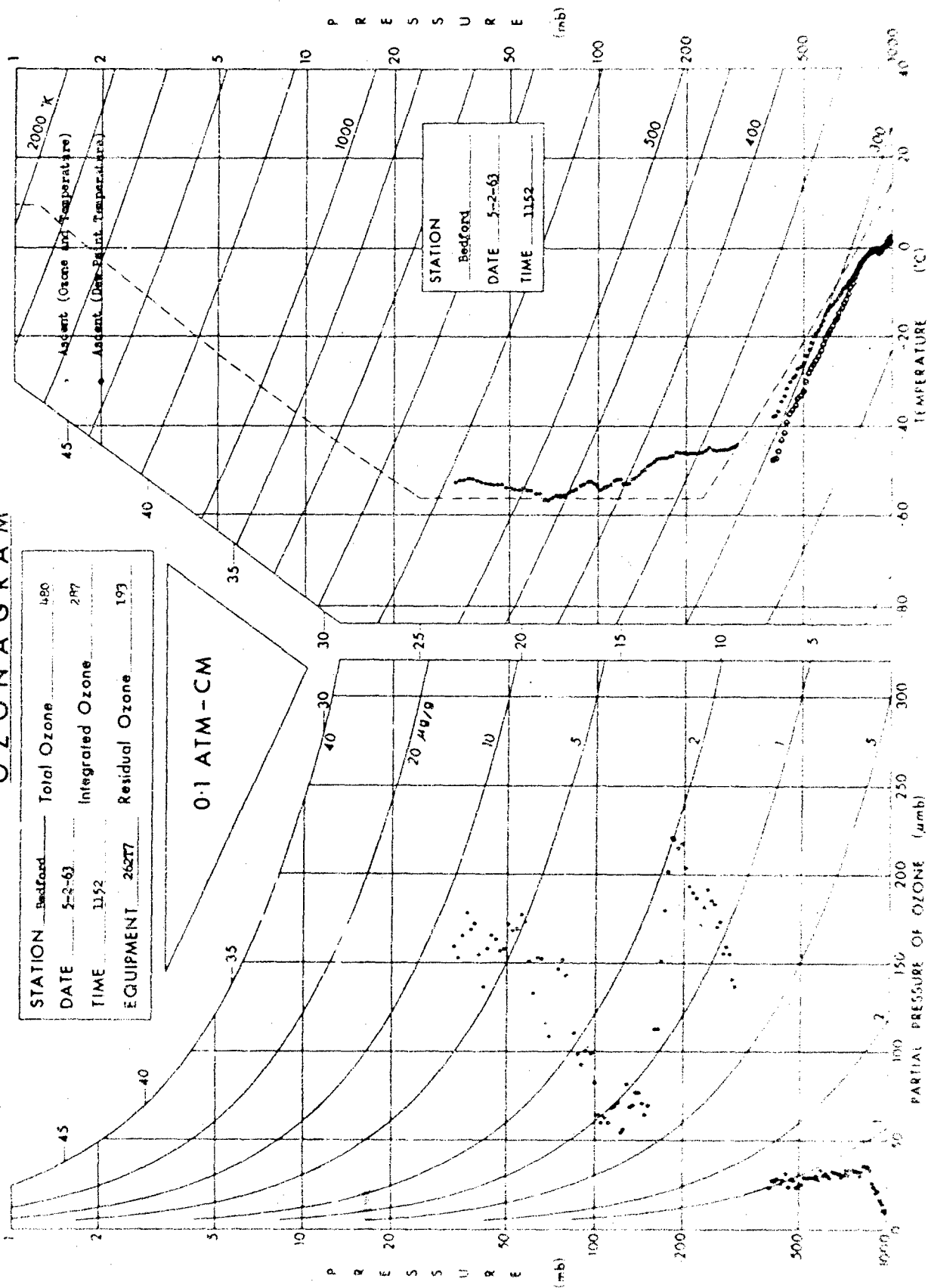
## O Z O N A G R A M

STATION Colorado Total Ozone 440  
 DATE 5-2-63 Integrated Ozone 394  
 TIME 1146 Residual Ozone 46  
 EQUIPMENT 11777

0.1 ATM-CM



## O Z O N A G R A M

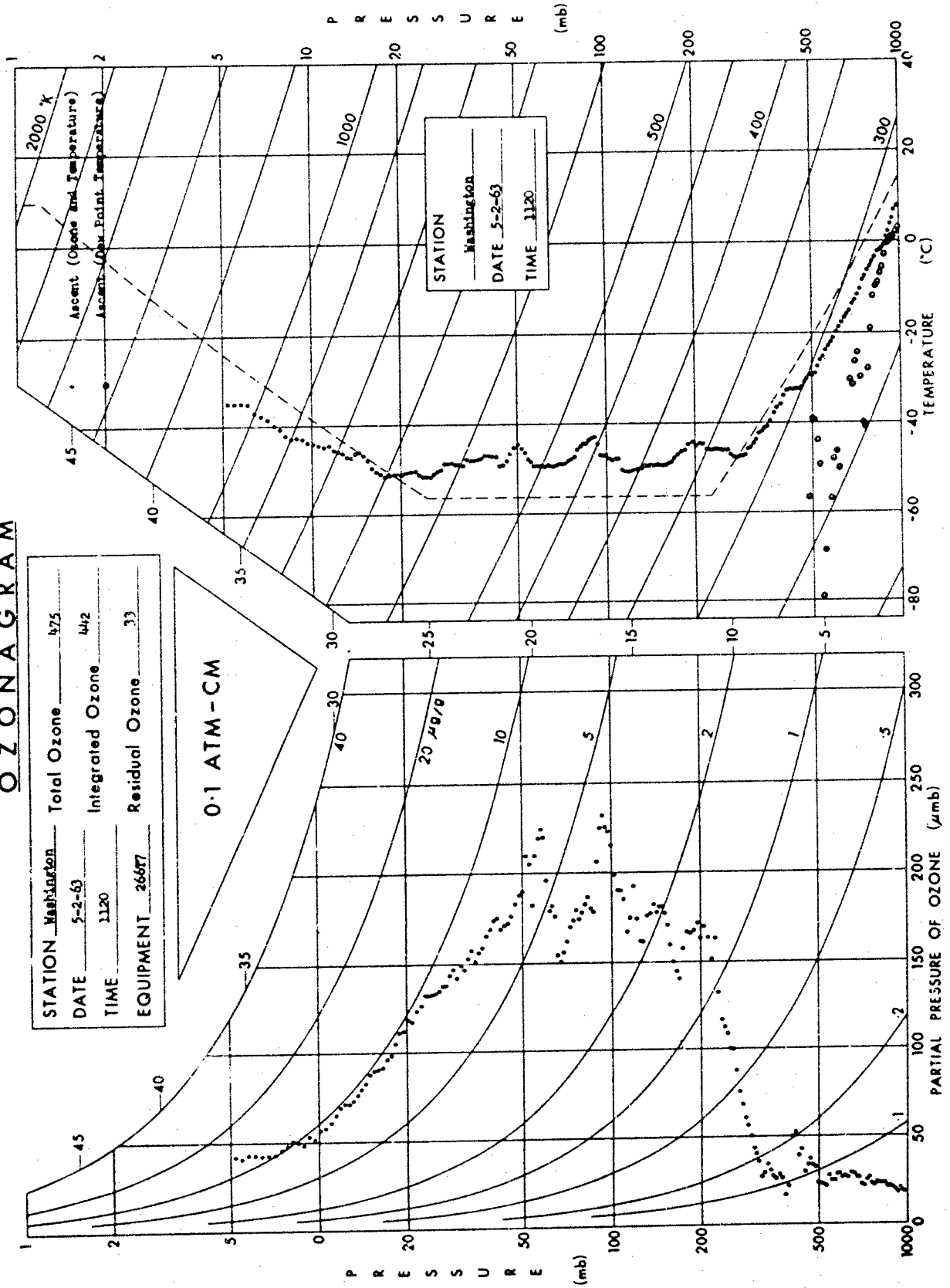




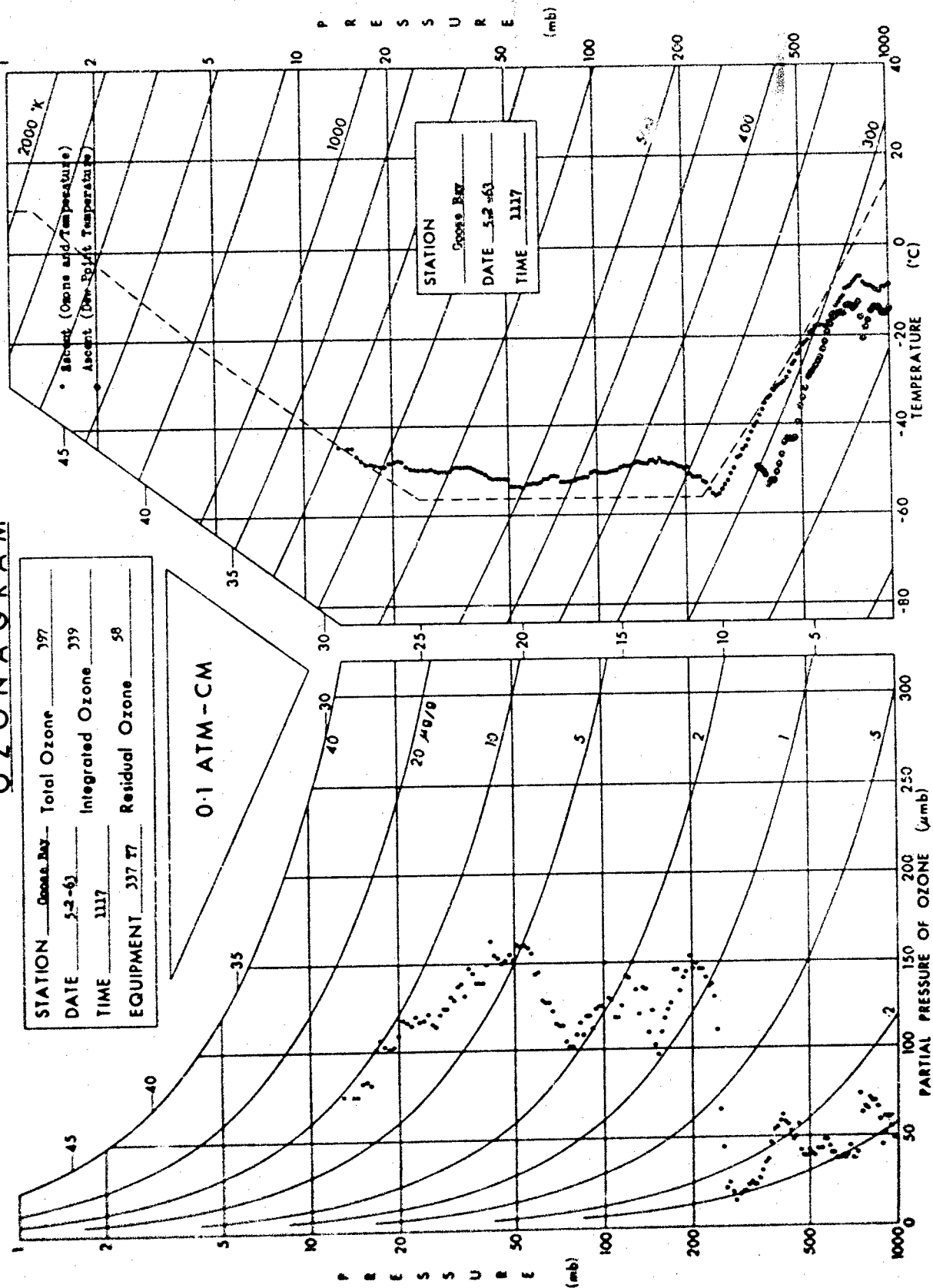
## O Z O N A G R A M

STATION Washington Total Ozone 475  
 DATE 5-2-63 Integrated Ozone 442  
 TIME 1120 Residual Ozone 33  
 EQUIPMENT 26677

0.1 ATM-CM



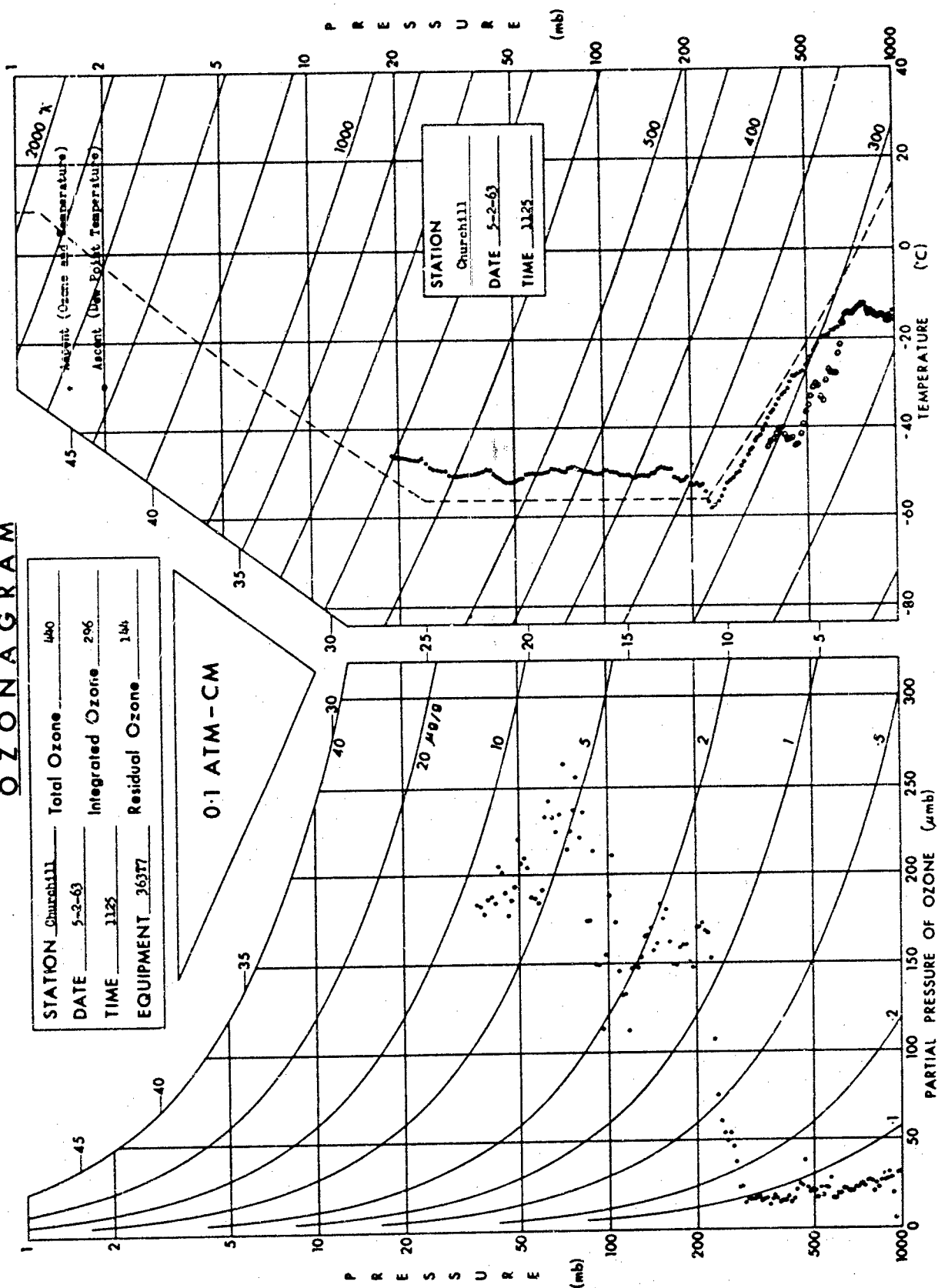
## OZONAGRAM

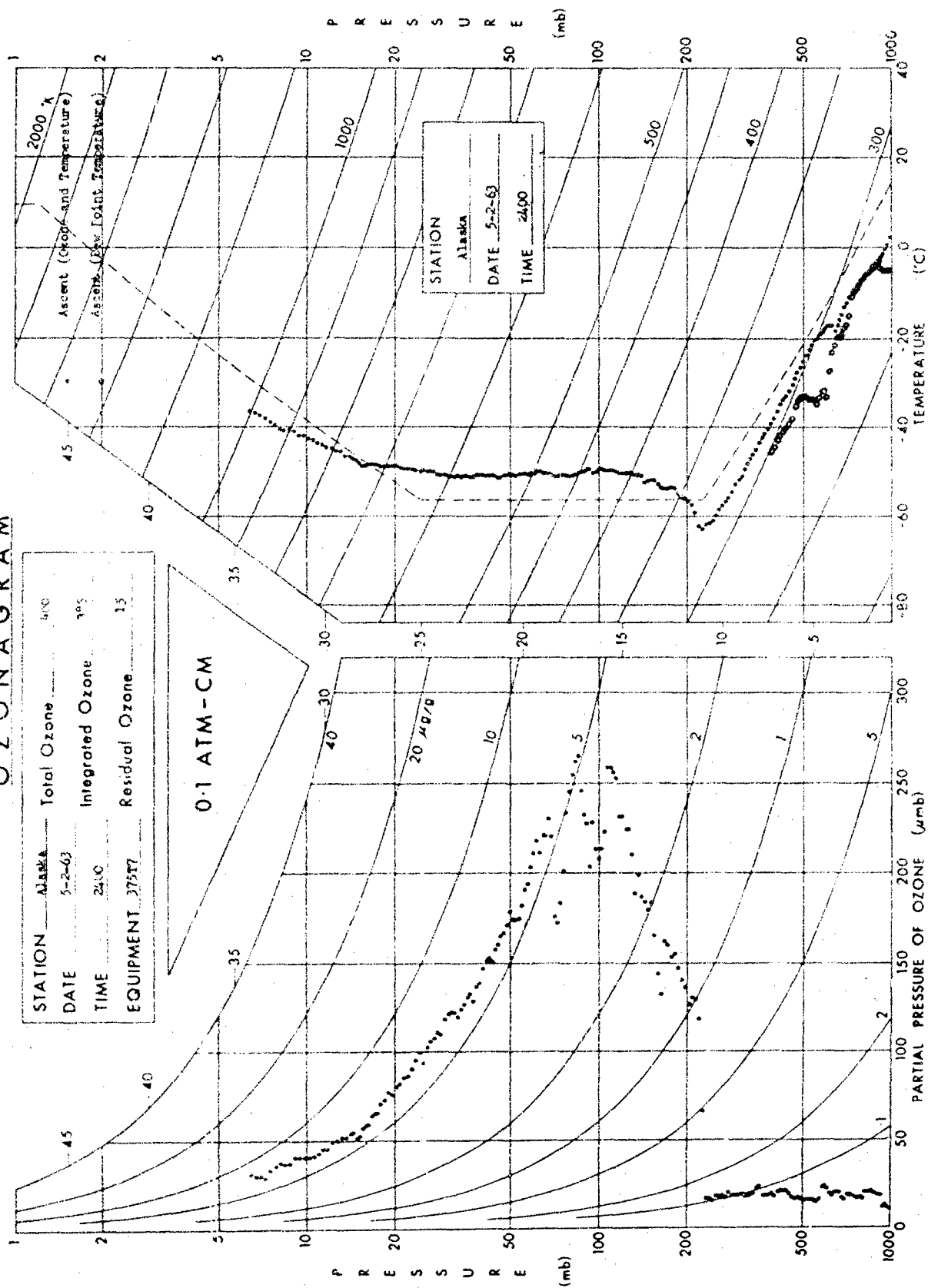


# OZONAGRAM

STATION Churchill Total Ozone 440  
 DATE 5-2-63 Integrated Ozone 296  
 TIME 1125 Residual Ozone 144  
 EQUIPMENT 36377

0.1 ATM-CM

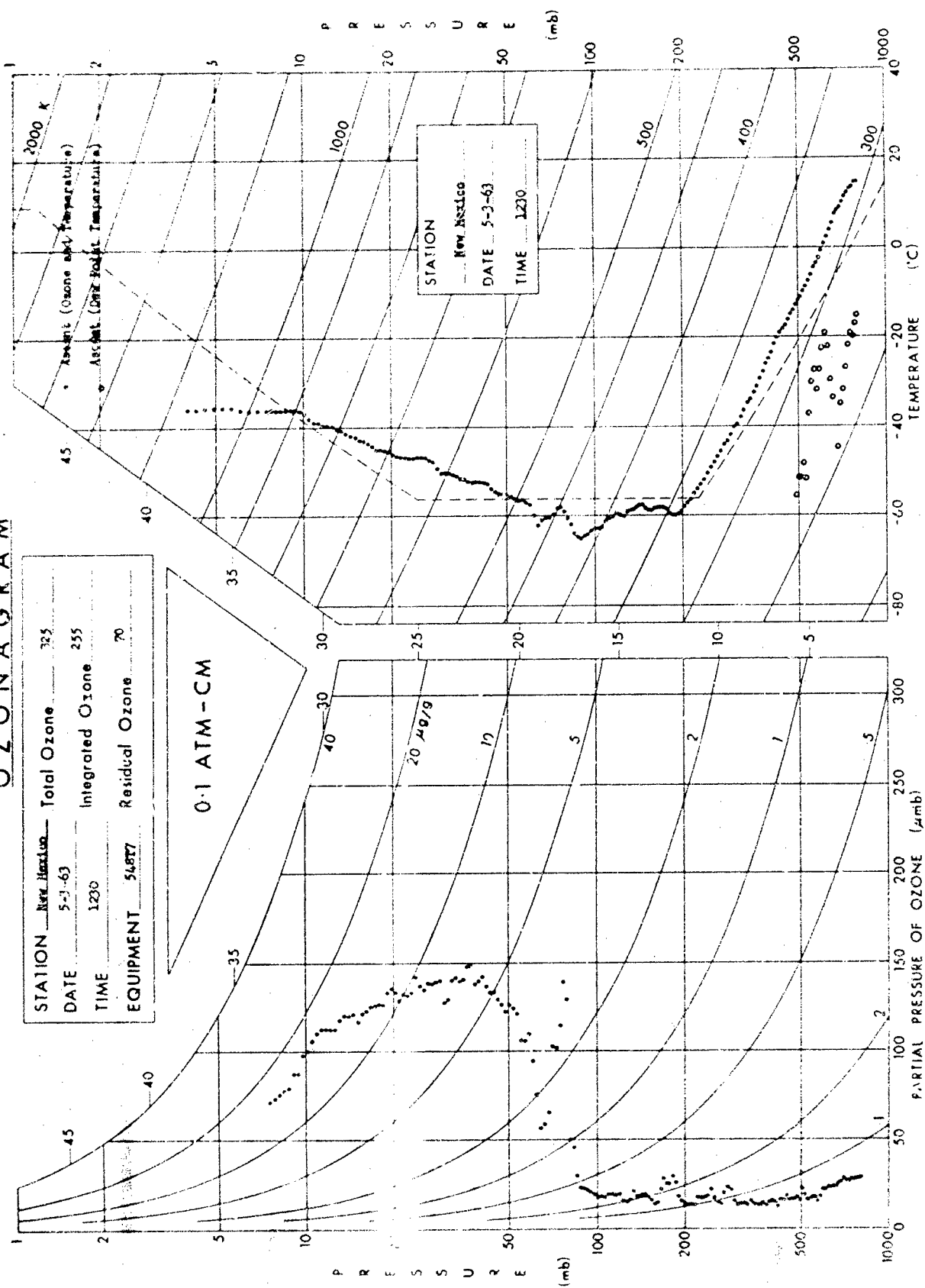


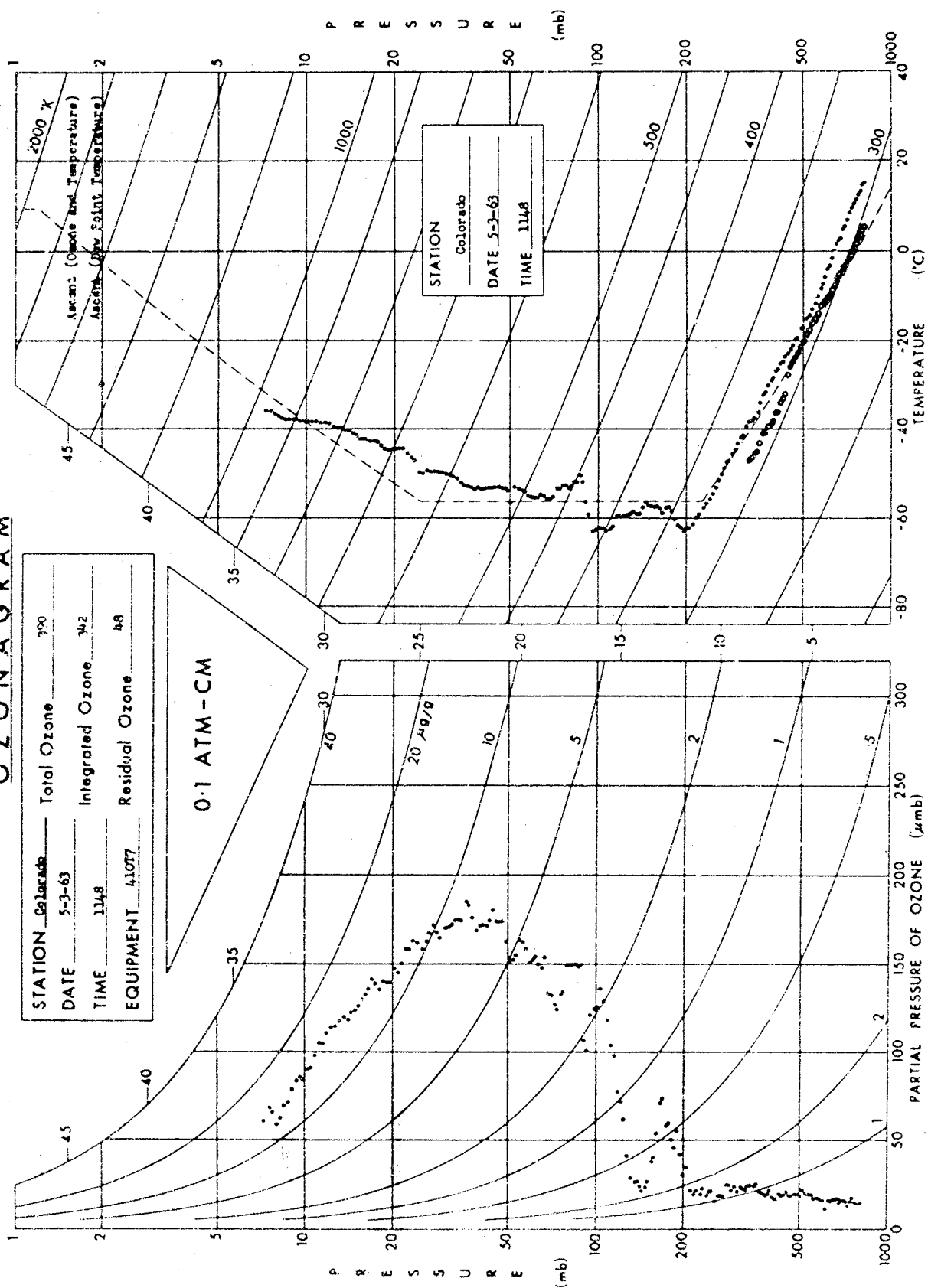


## O Z O N A G R A M

STATION New Mexico Total Ozone 325  
 DATE 5-3-63 Integrated Ozone 255  
 TIME 1230 Residual Ozone 70  
 EQUIPMENT 54877

0.1 ATM-CM

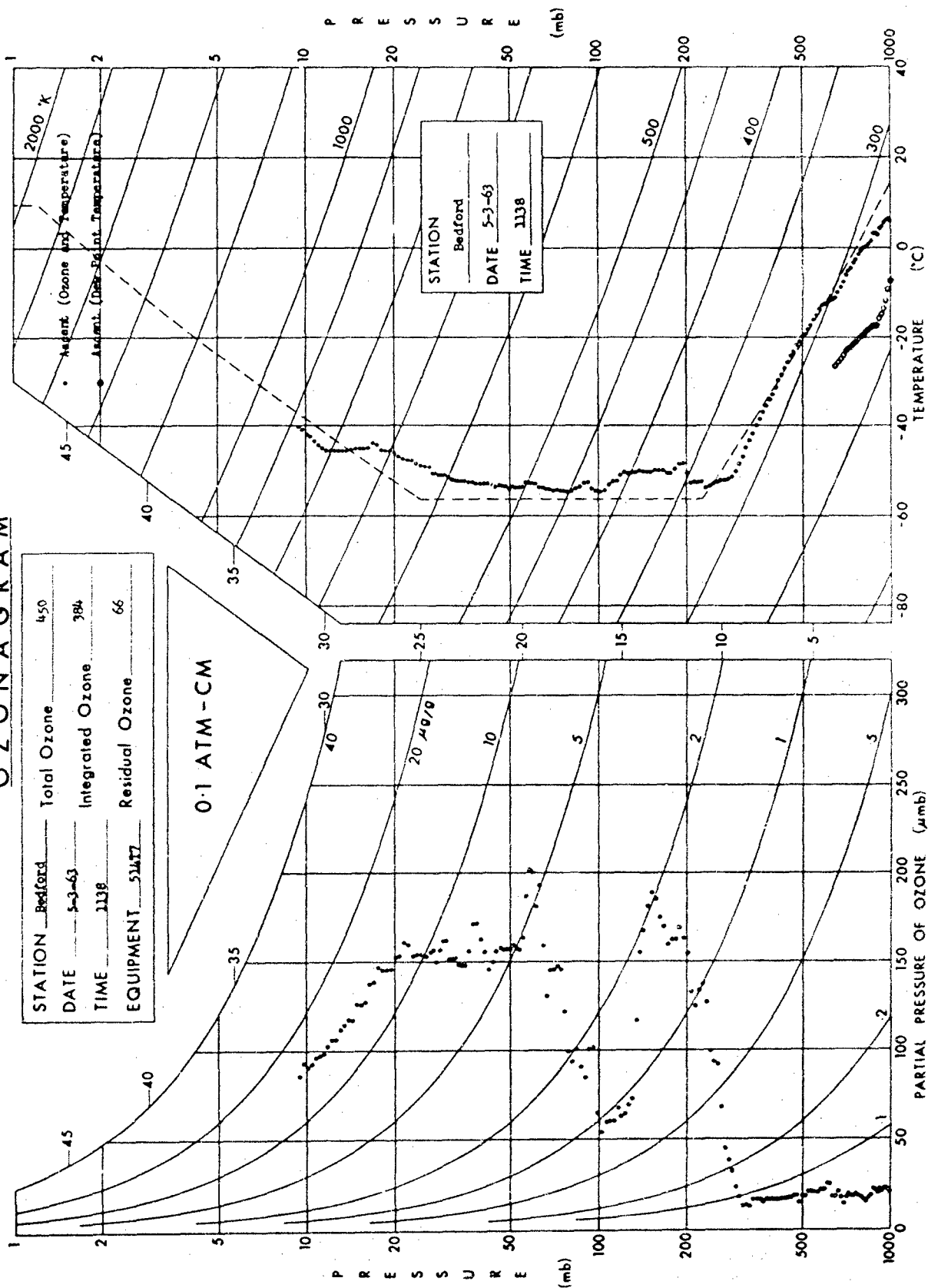




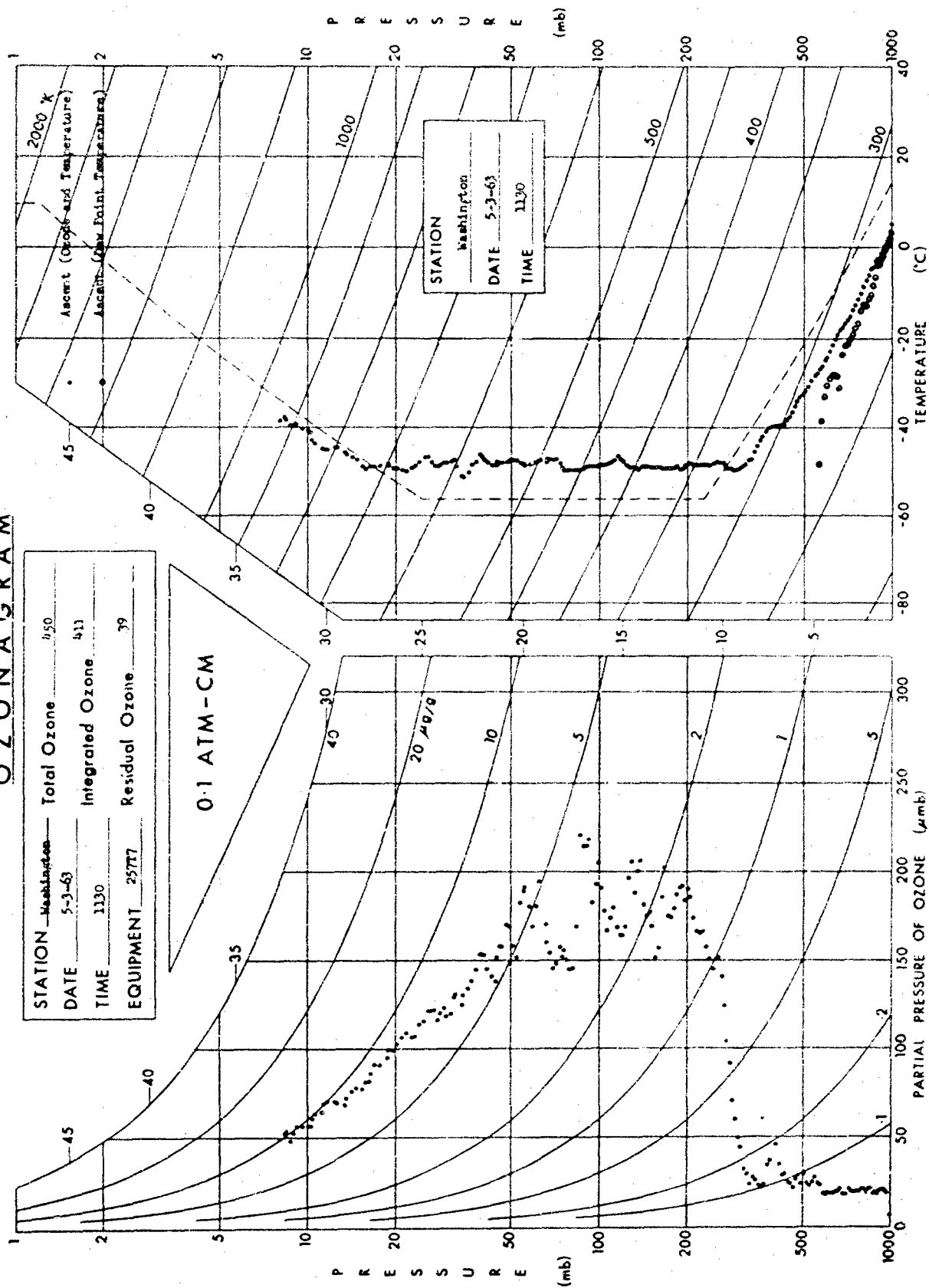
# OZONAGRAM

STATION	Bedford	Total Ozone	450
DATE	5-3-63	Integrated Ozone	384
TIME	1138	Residual Ozone	66
EQUIPMENT	53477		

0.1 ATM-CM

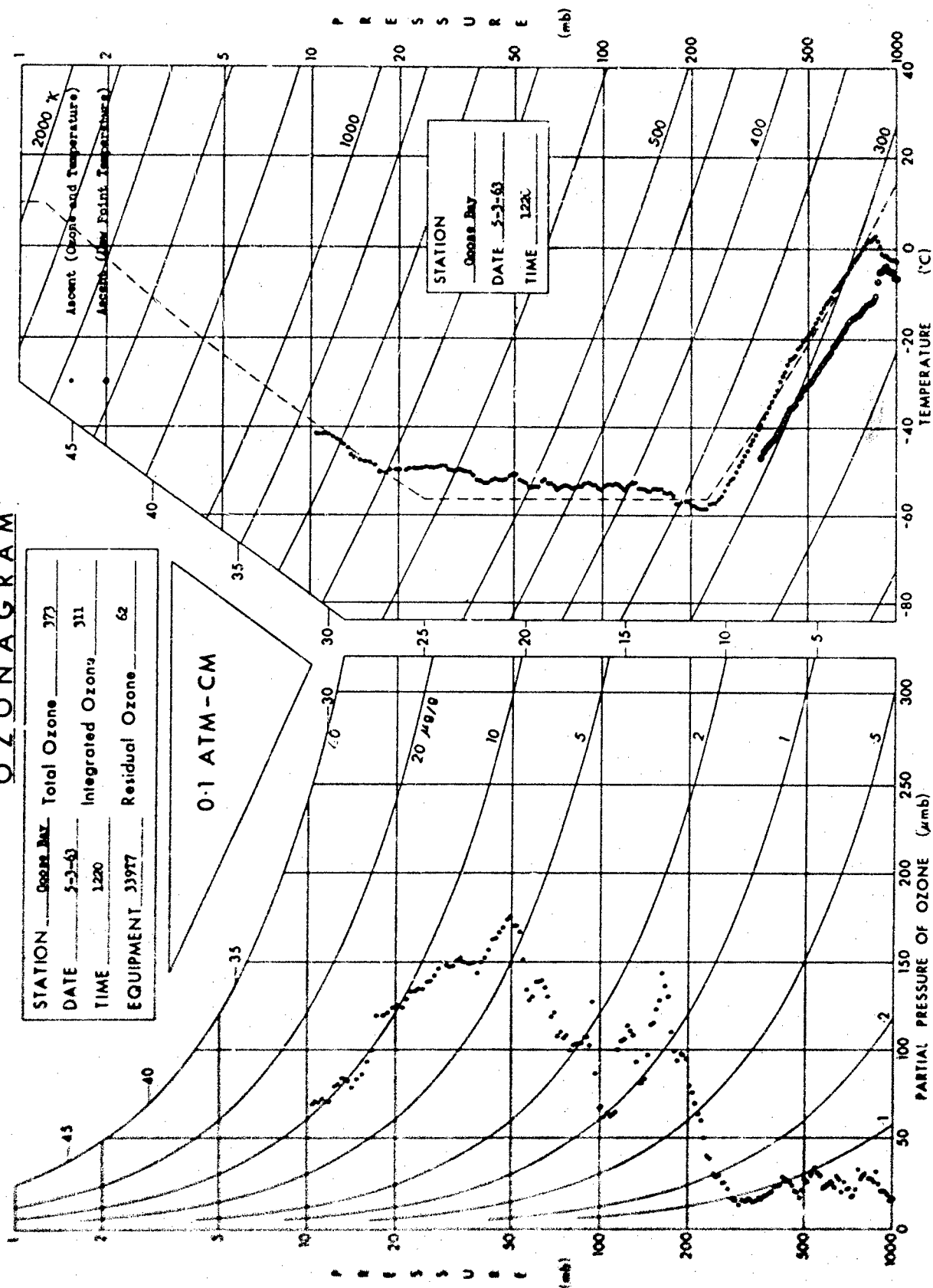


## O Z O N A G R A M

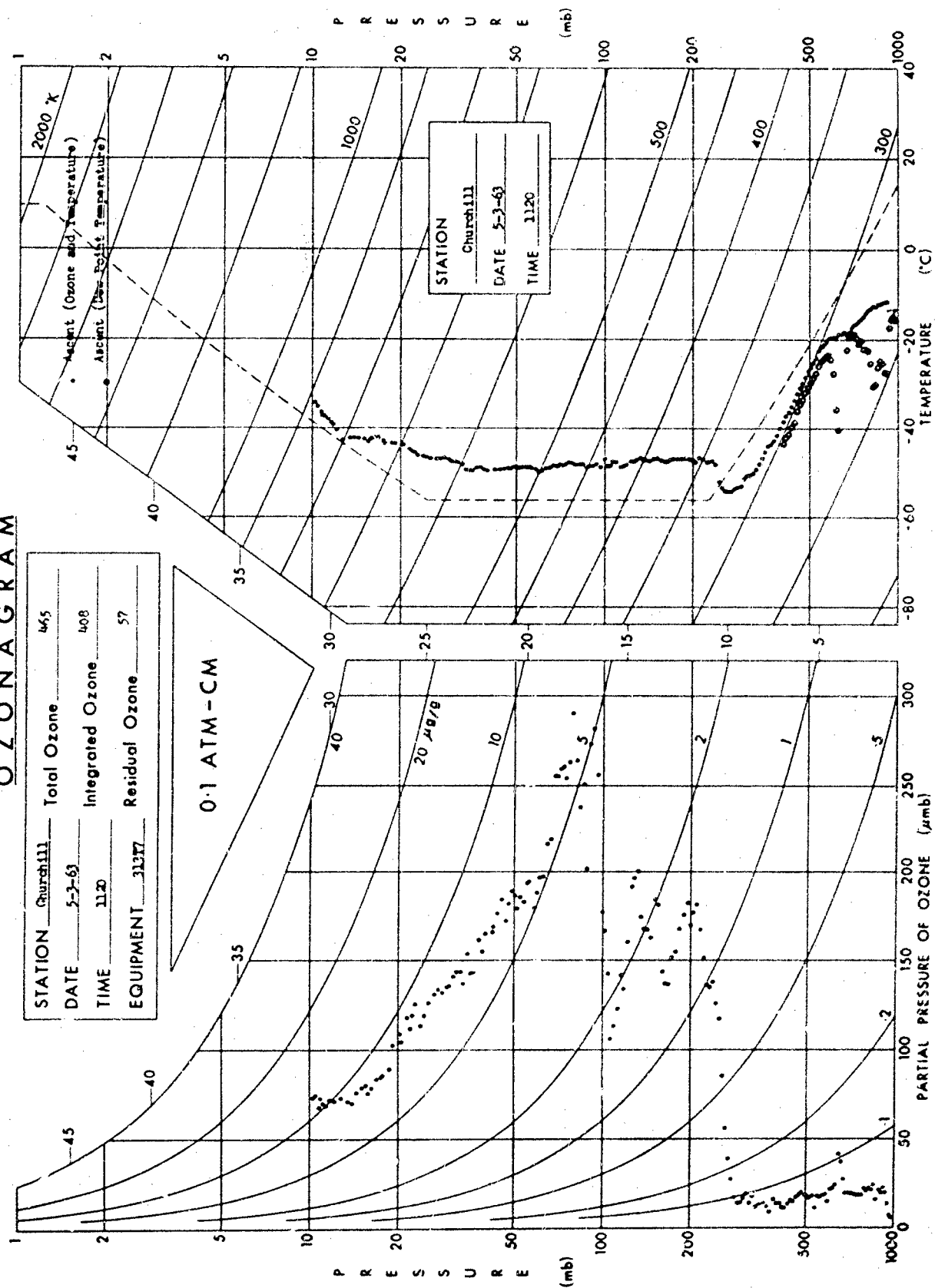




Q Z O N A G R A M



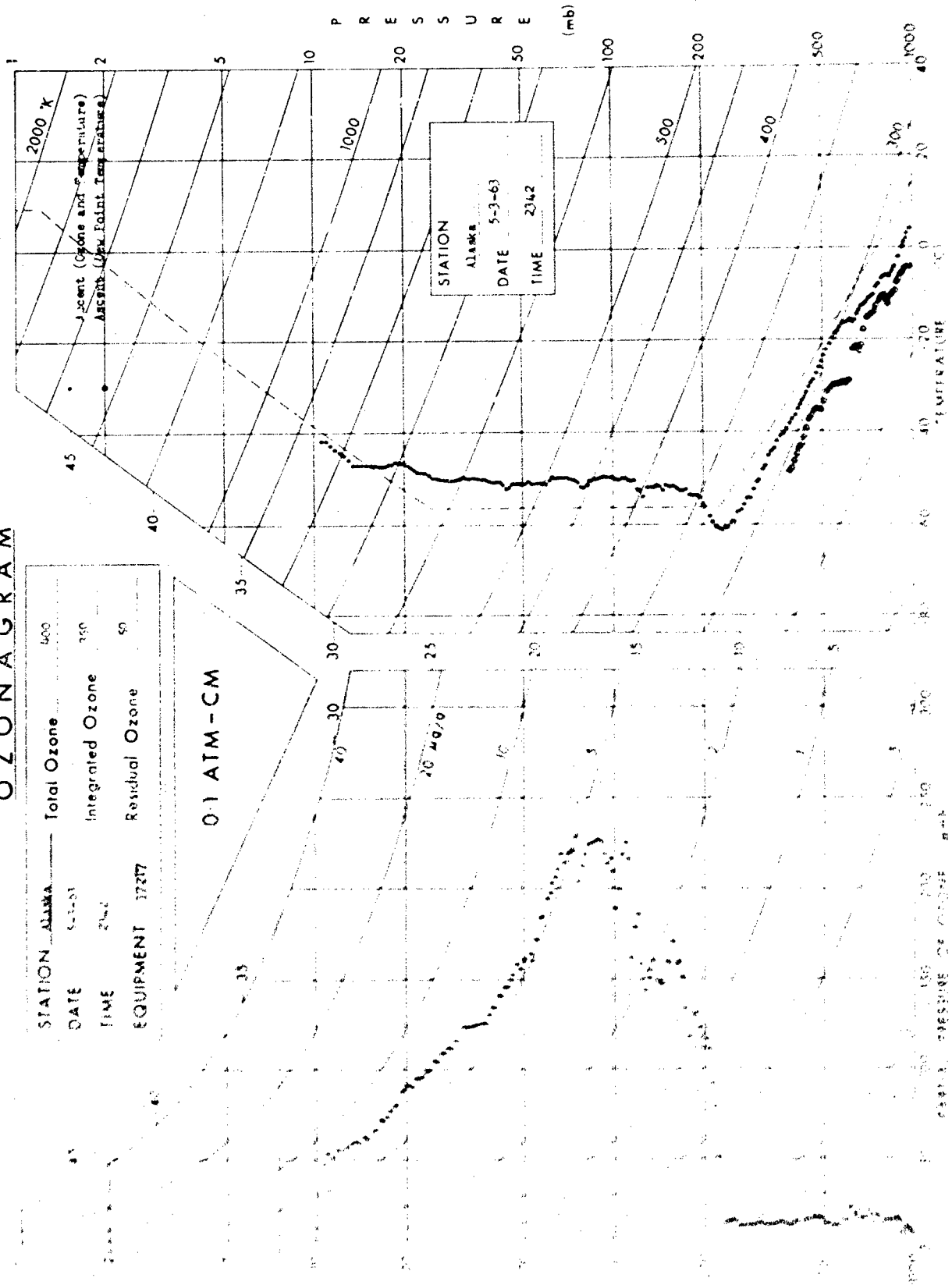
## OZONAGRAM



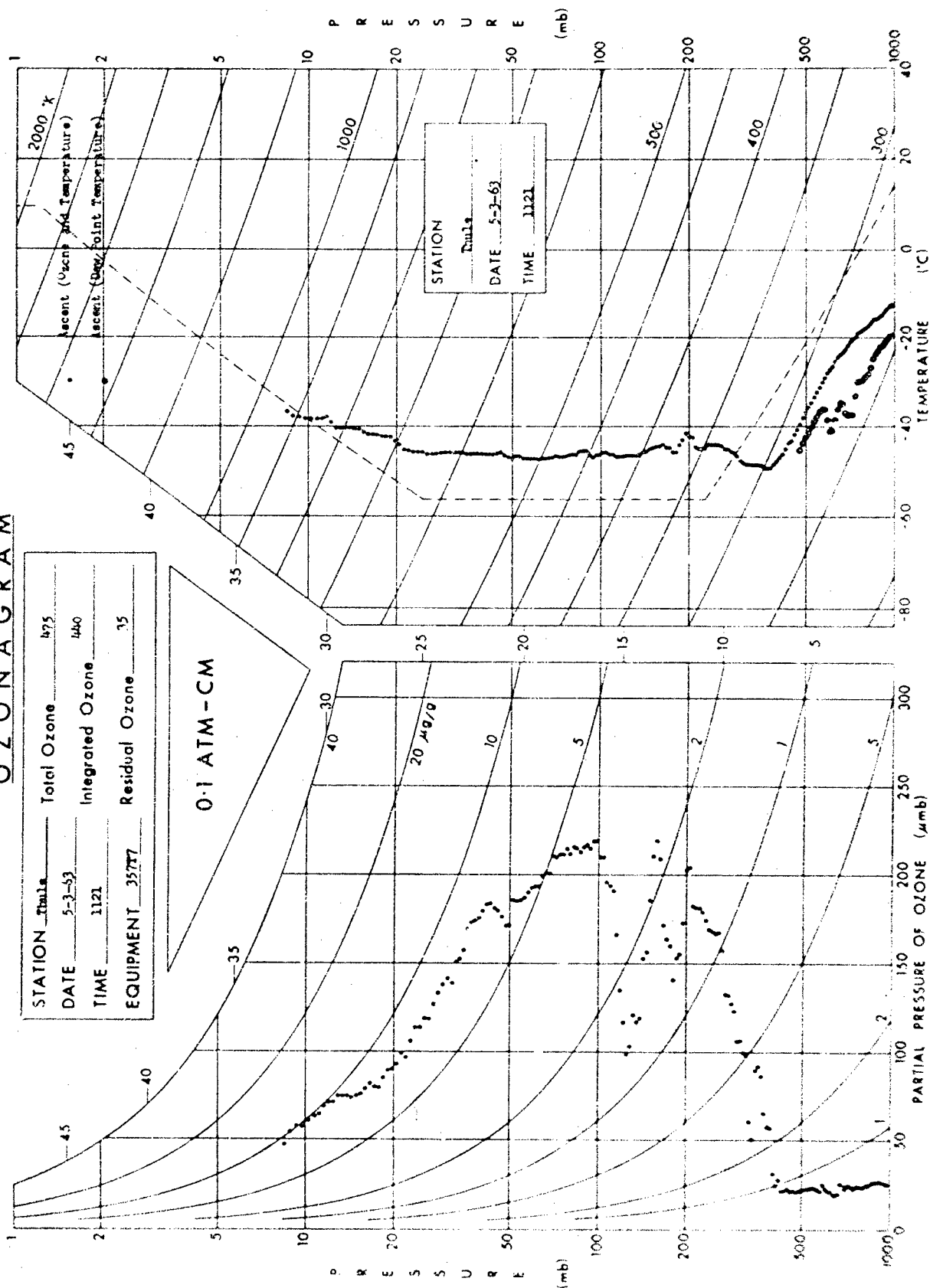
# OZONAGRAM

STATION Alaska      Total Ozone      400  
 DATE 5-3-63      Integrated Ozone      250  
 TIME 2342      Residual Ozone      60  
 EQUIPMENT 17277

01 ATM-CM



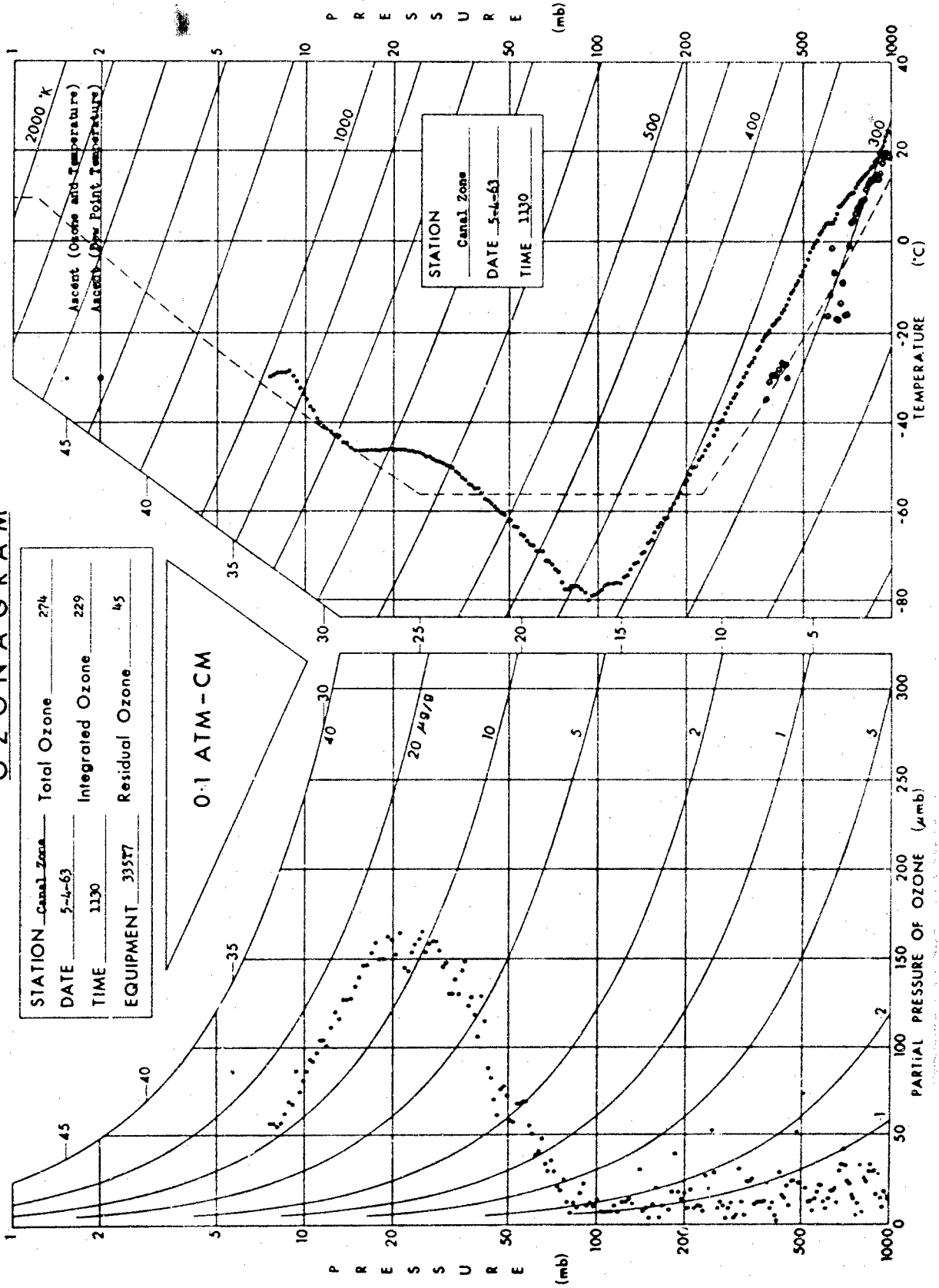
## OZONAGRAM



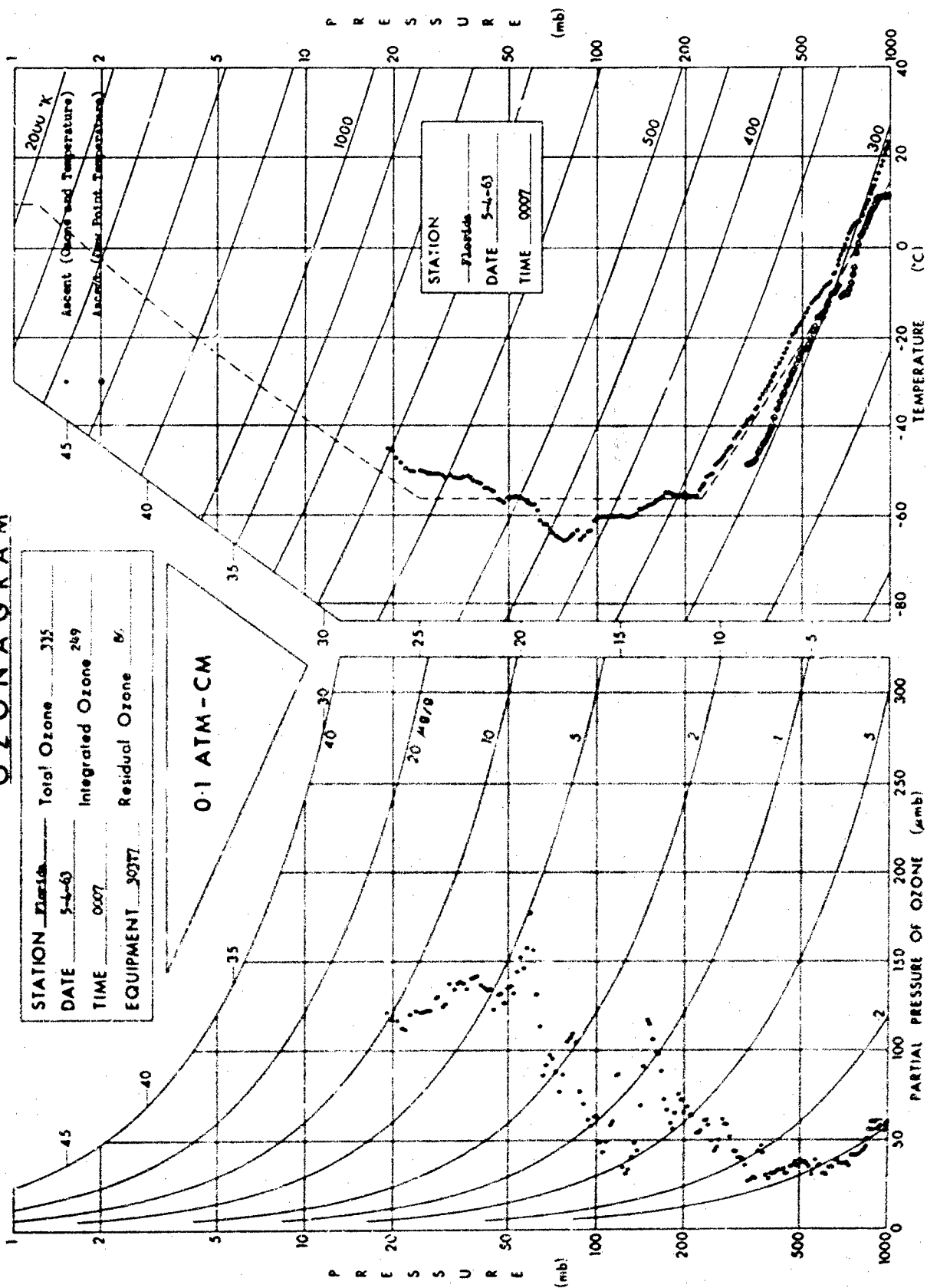
# OZONAGRAM

STATION	Canal Zone	Total Ozone	274
DATE	5-4-63	Integrated Ozone	229
TIME	1130	Residual Ozone	45
EQUIPMENT	33577		

0.1 ATM-CM



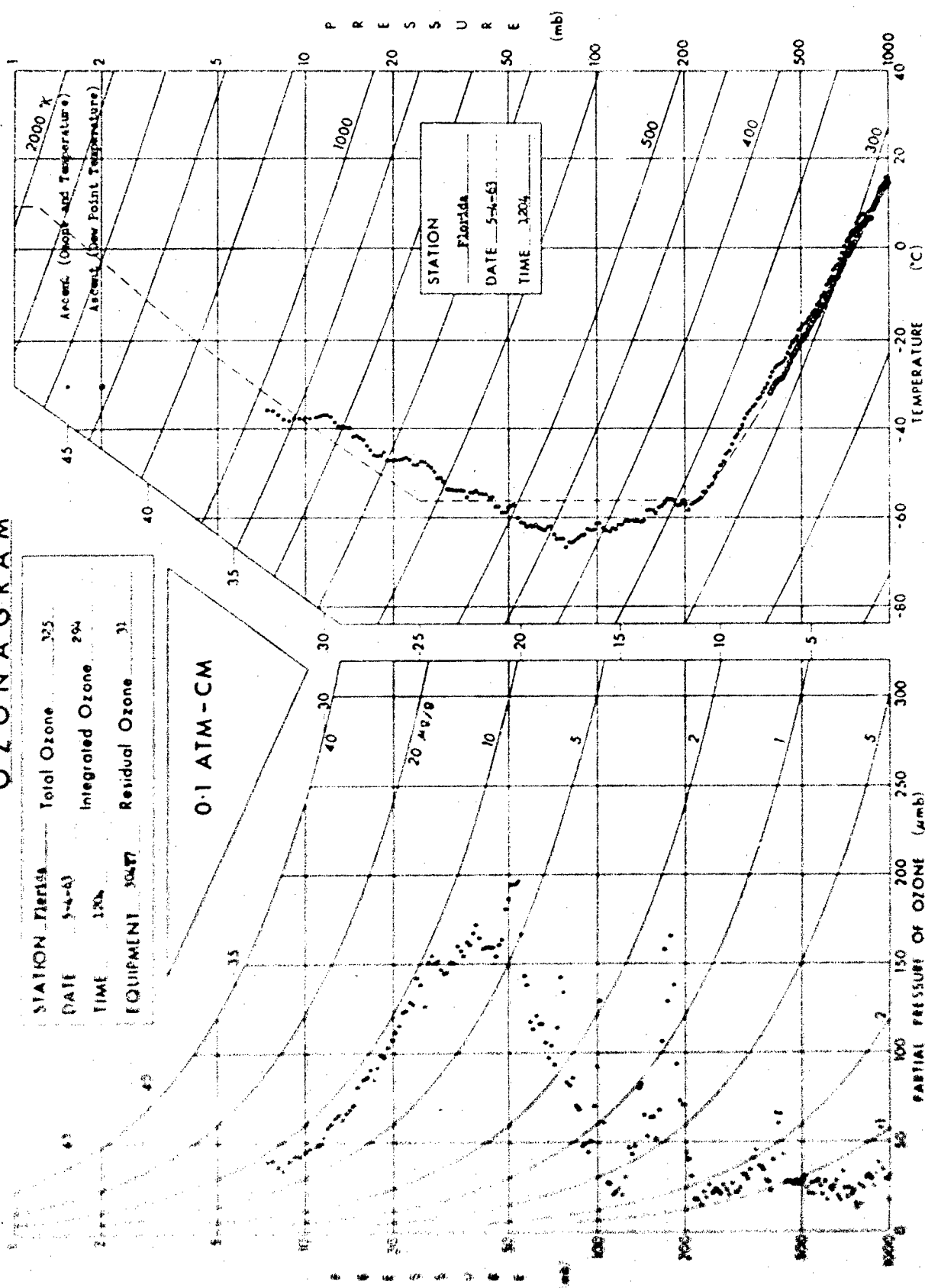
## O Z O N A G R A M



## OZONAGRAM

STATION Florida Total Ozone 325  
 DATE 5-4-63 Integrated Ozone 294  
 TIME 1204 Residual Ozone 31  
 EQUIPMENT 30477

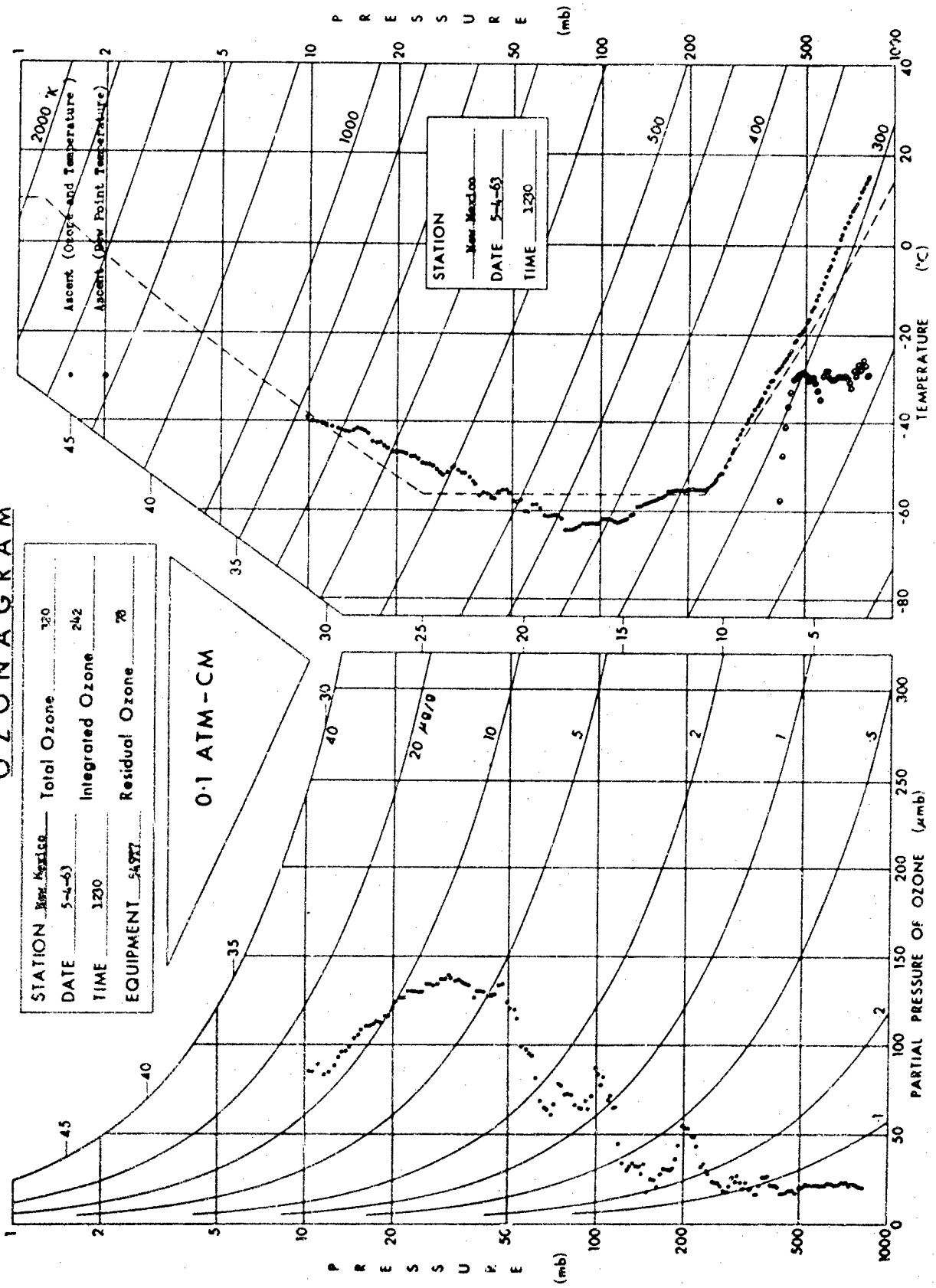
0.1 ATM-CM



# OZONAGRAM

STATION	New Mexico	Total Ozone	120
DATE	5-4-63	Integrated Ozone	242
TIME	1200	Residual Ozone	78
EQUIPMENT	54977		

0.1 ATM-CM

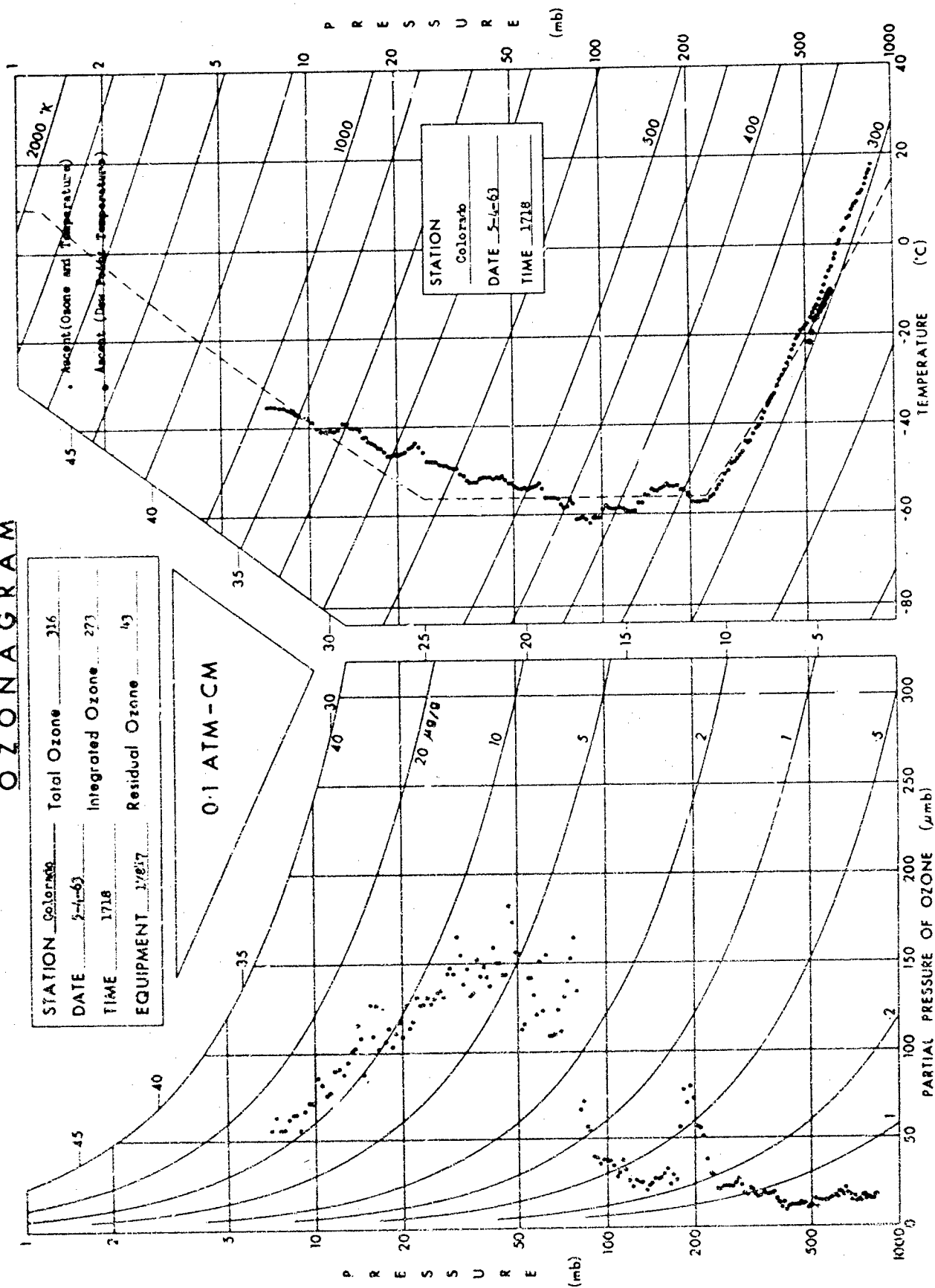




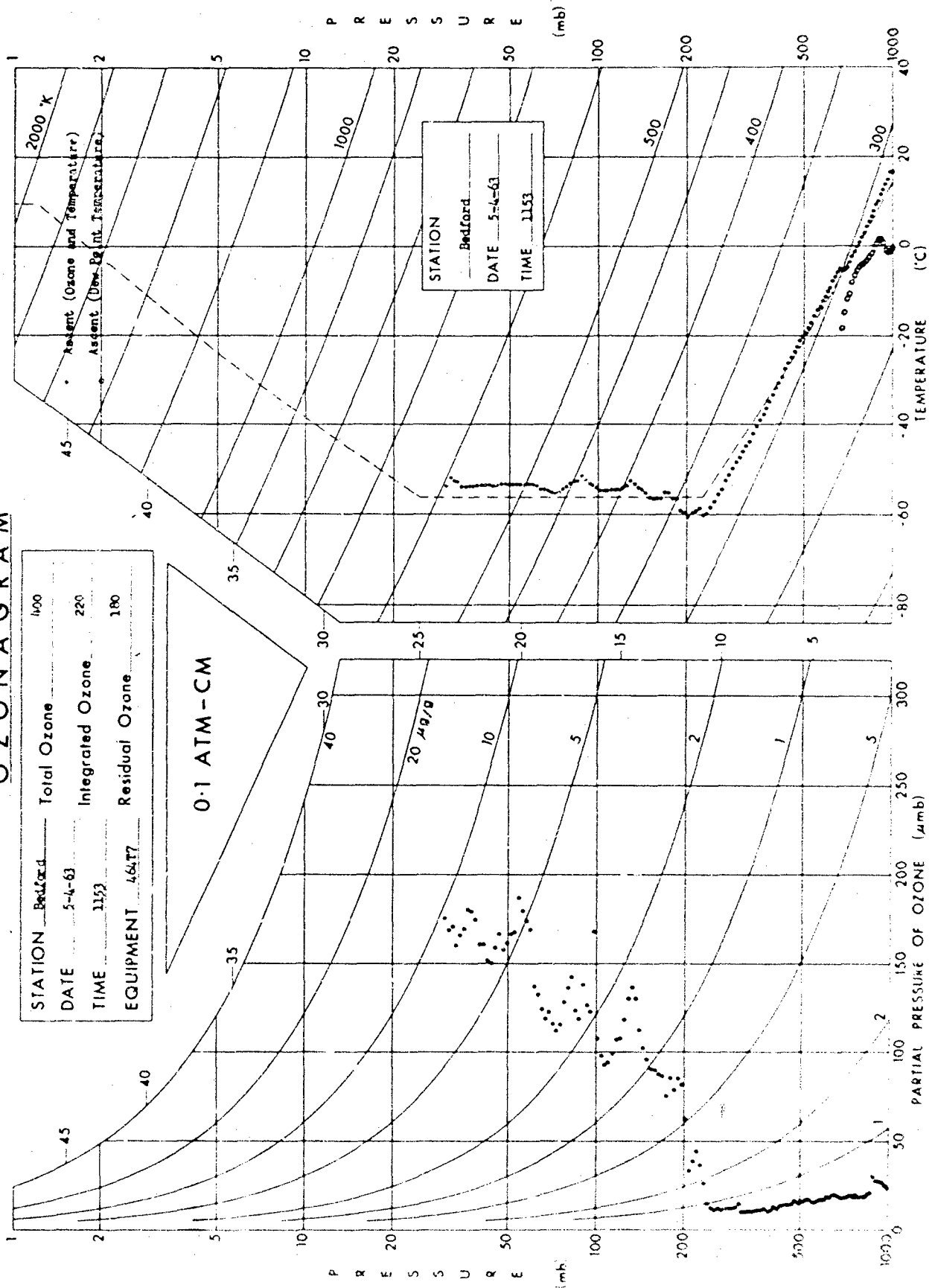
## O Z O N A G R A M

STATION Colorado Total Ozone 316  
 DATE 5-1-63 Integrated Ozone 273  
 TIME 1718 Residual Ozone 43  
 EQUIPMENT 17817

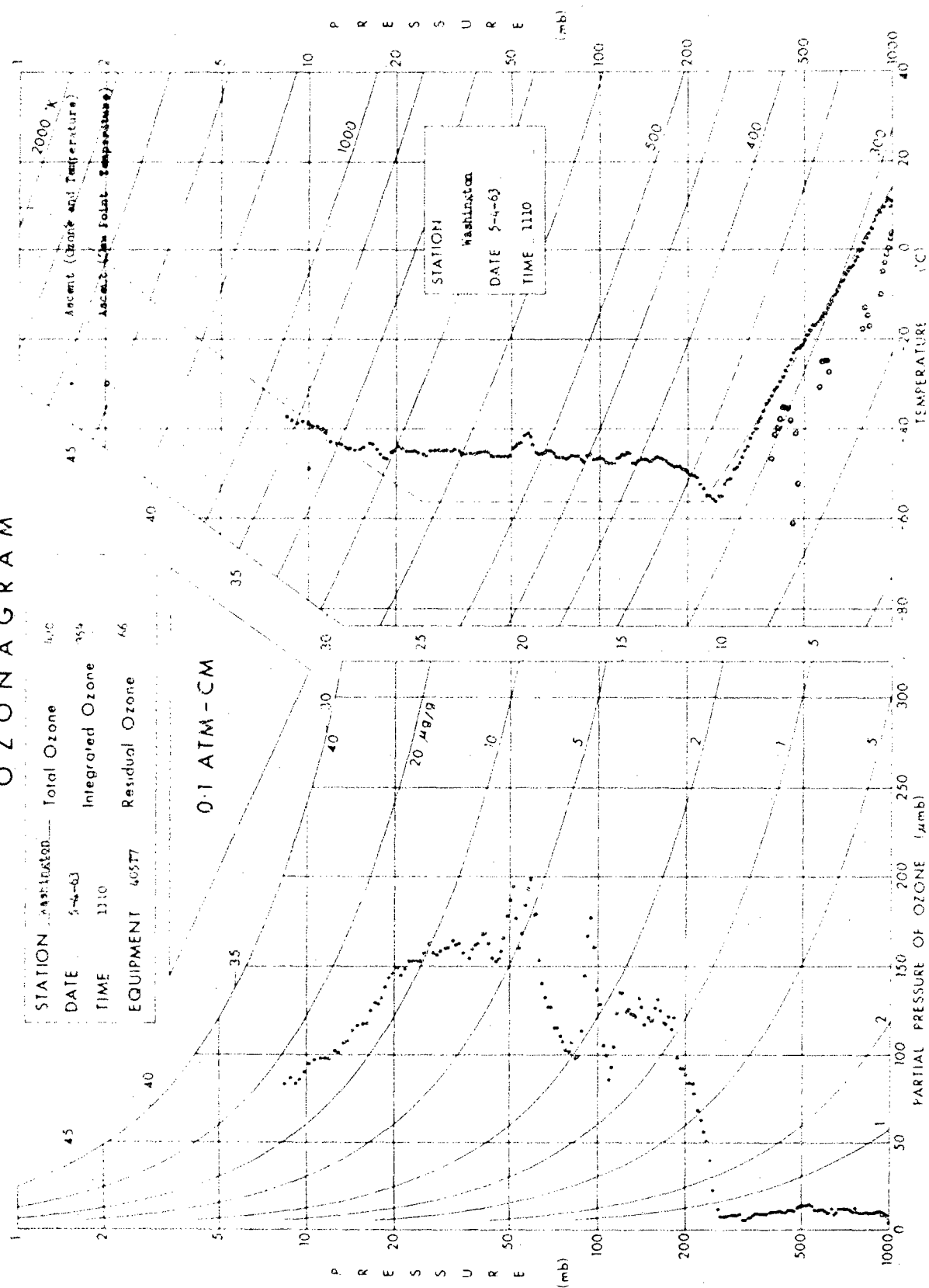
0.1 ATM-CM



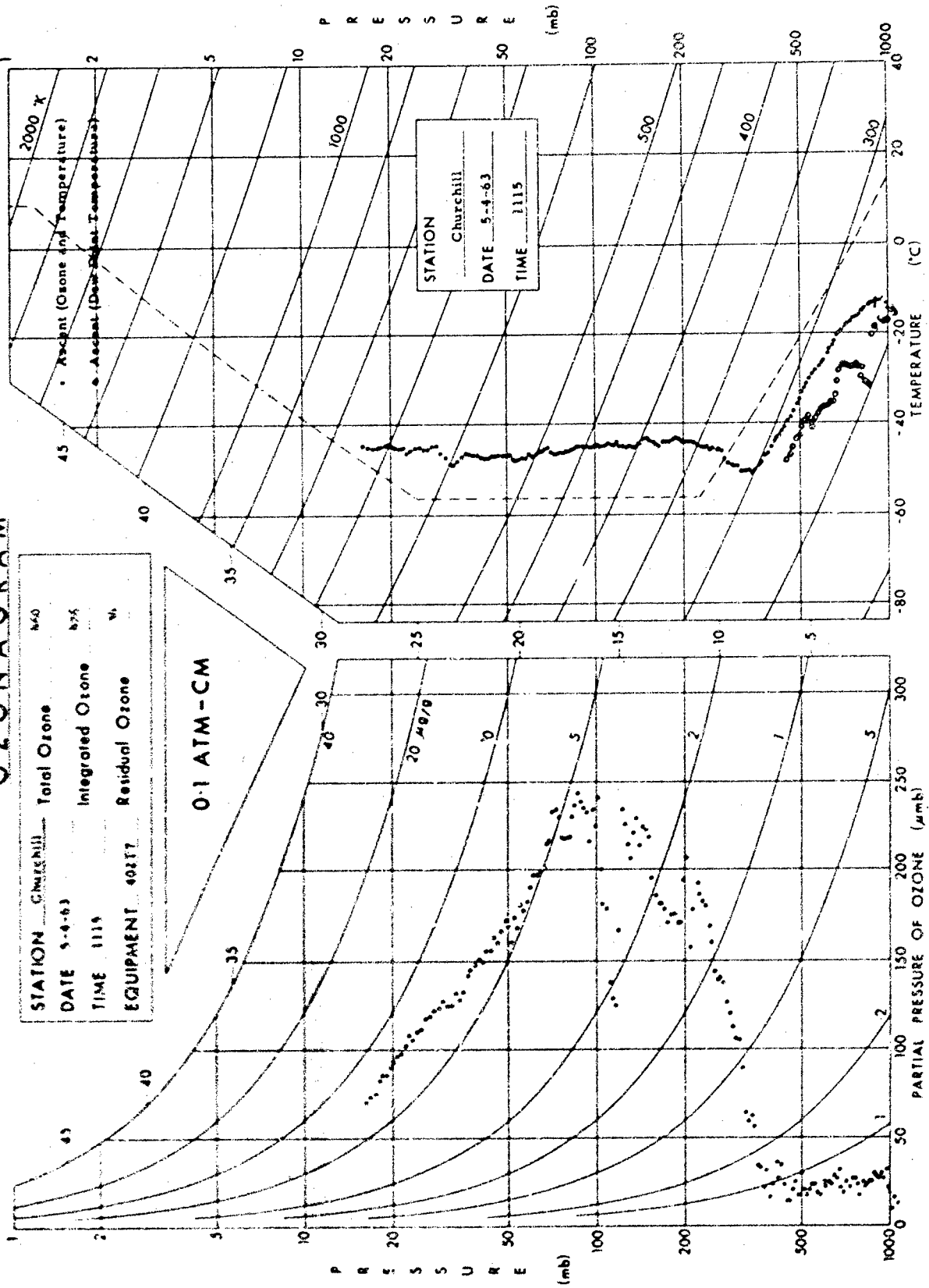
## OZONAGRAM



O Z O N A G R A M



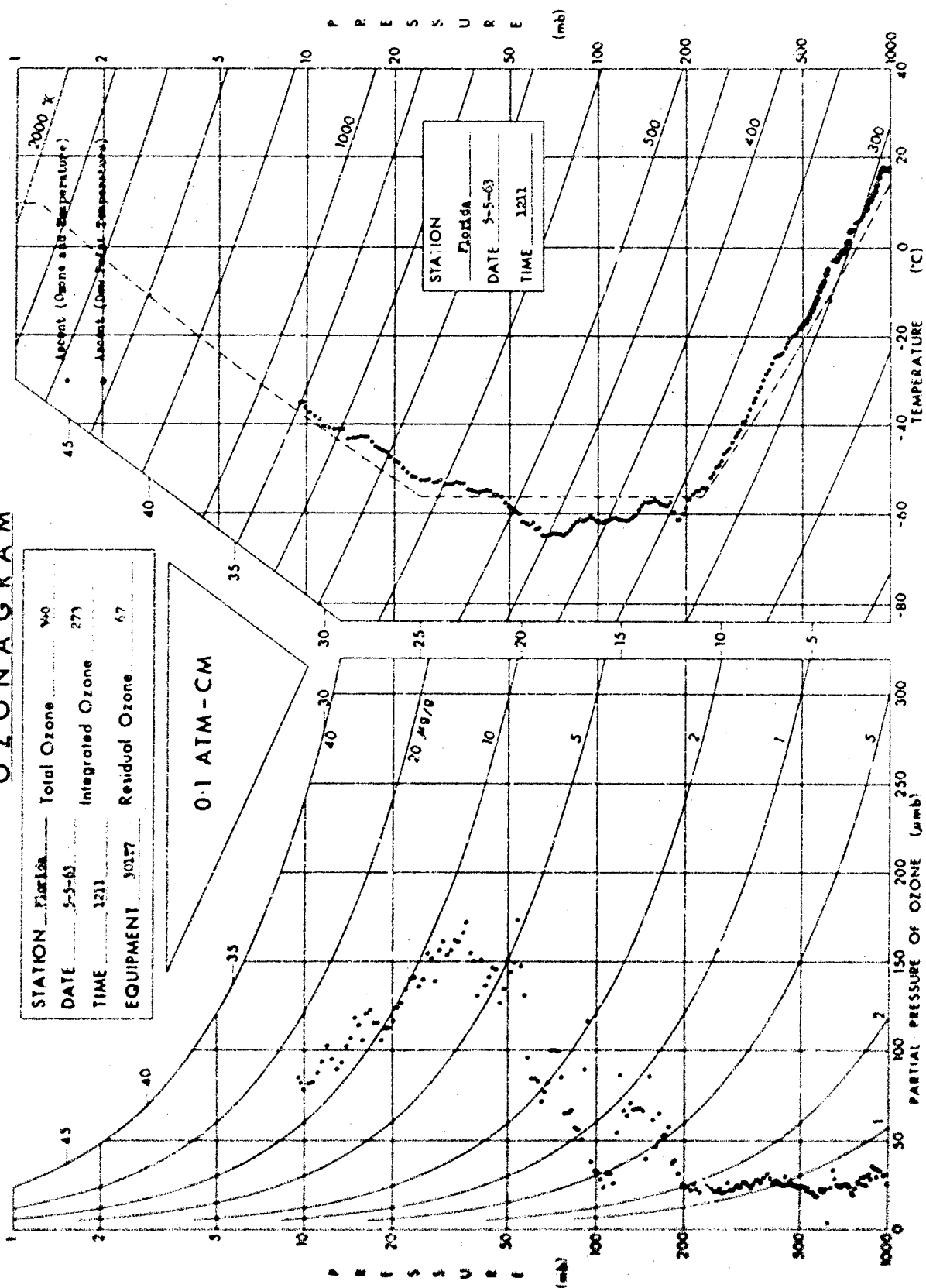
## OZONAGRAM



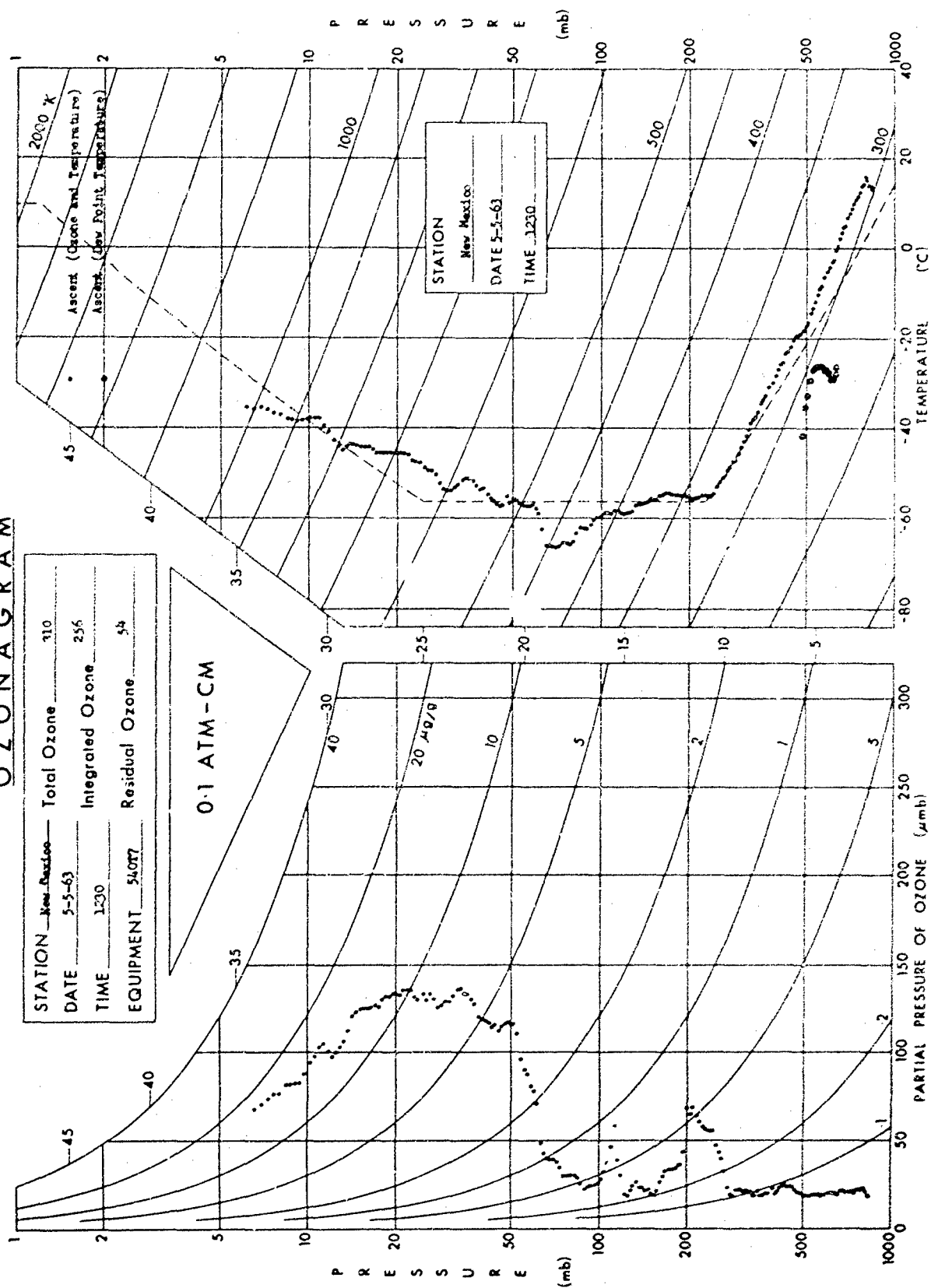
## OZONAGRAM

STATION	Florida	Total Ozone	940
DATE	5-5-63	Integrated Ozone	279
TIME	1211	Residual Ozone	67
EQUIPMENT	90177		

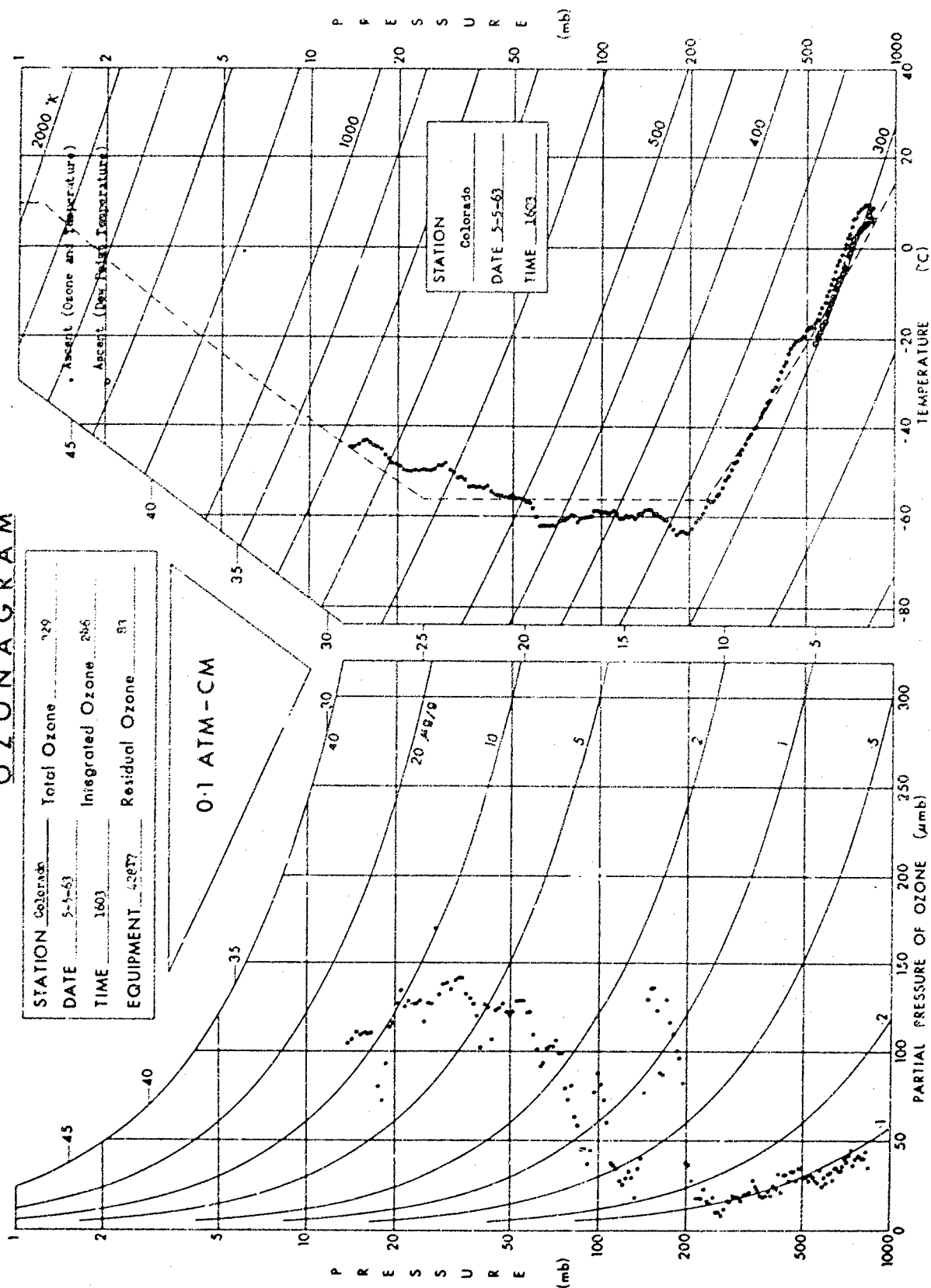
0.1 ATM-CM



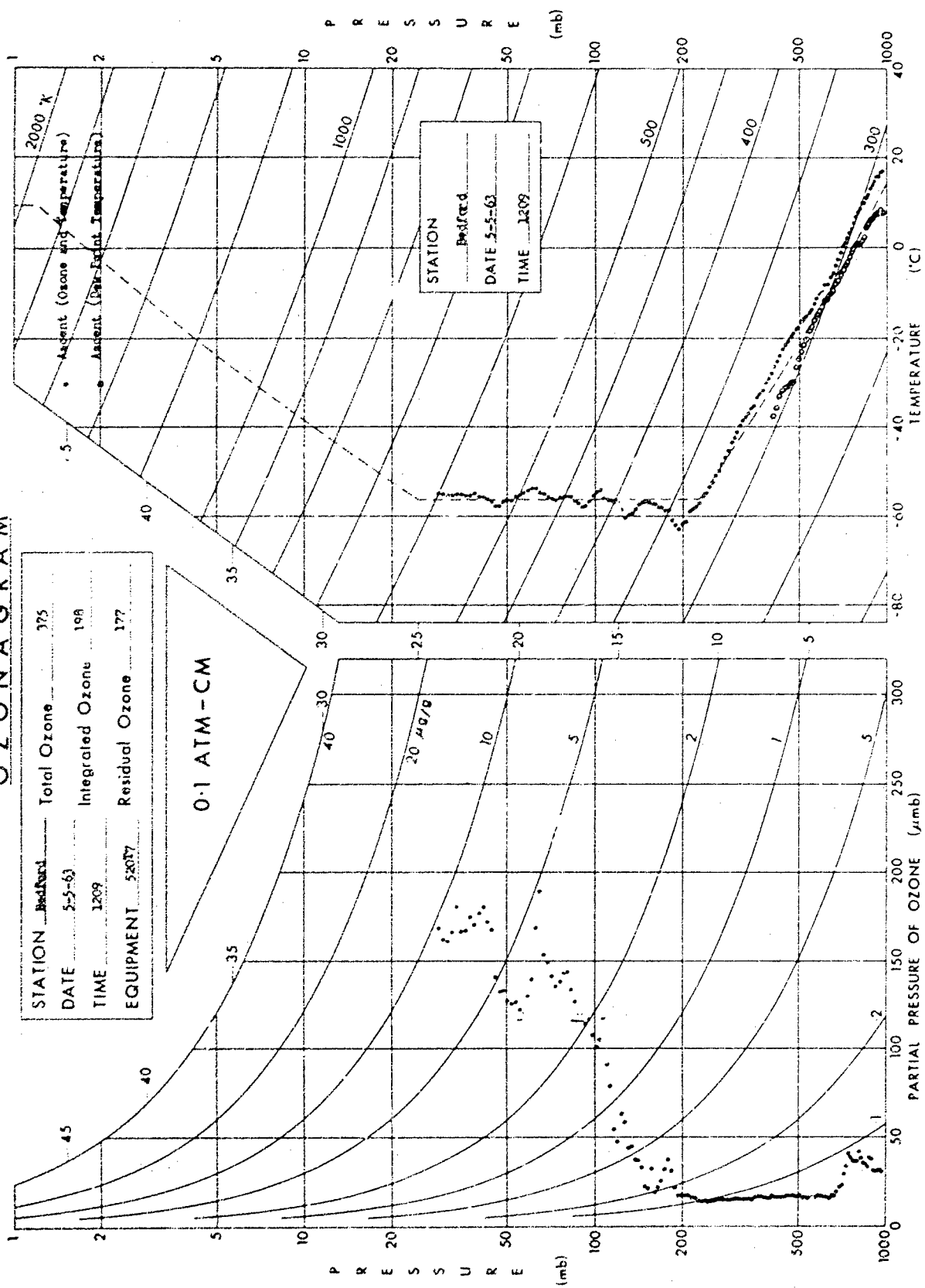
## OZONAGRAM



## O Z O N A G R A M

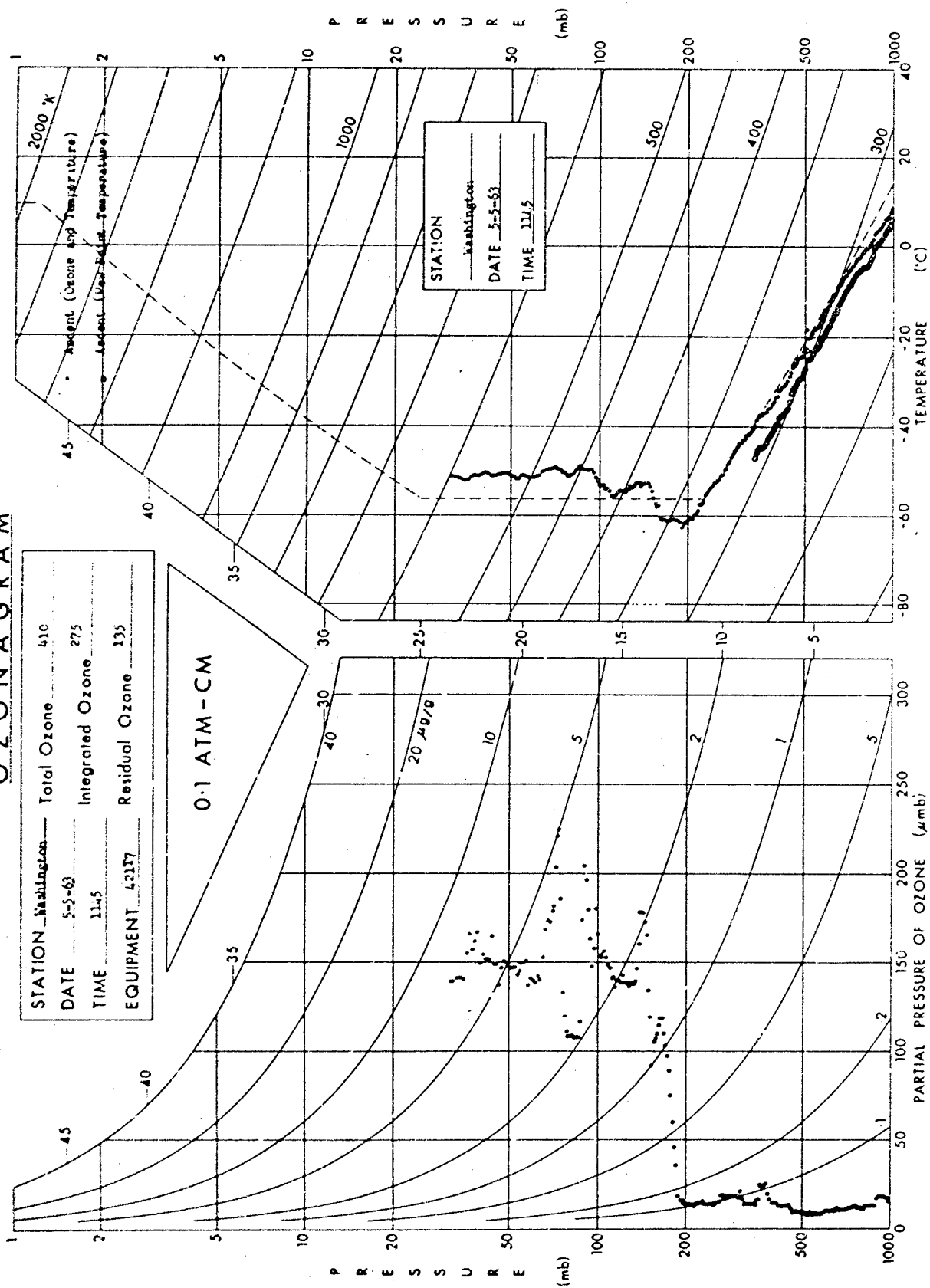


## O Z O N A G R A M

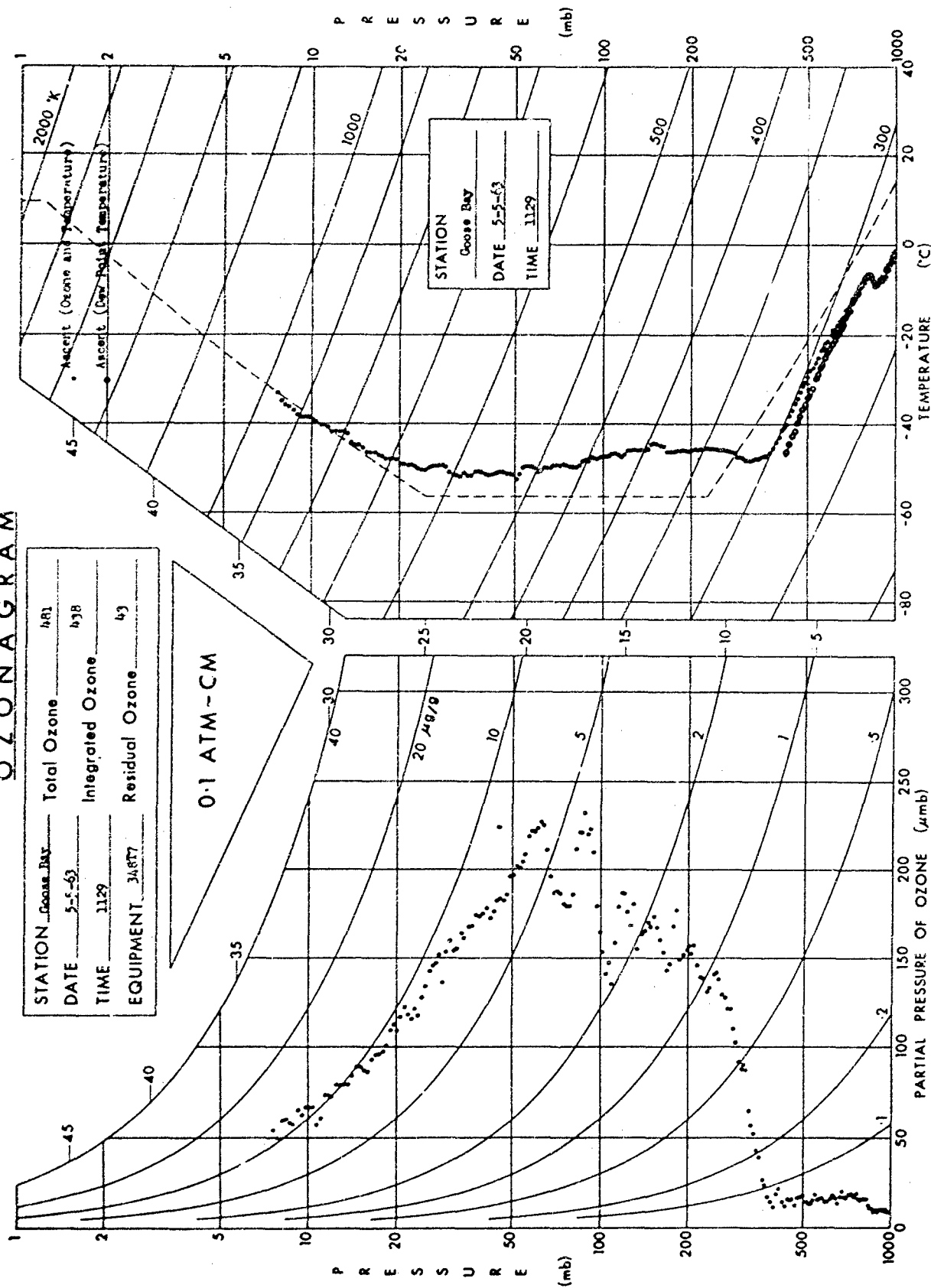




## O Z O N A G R A M



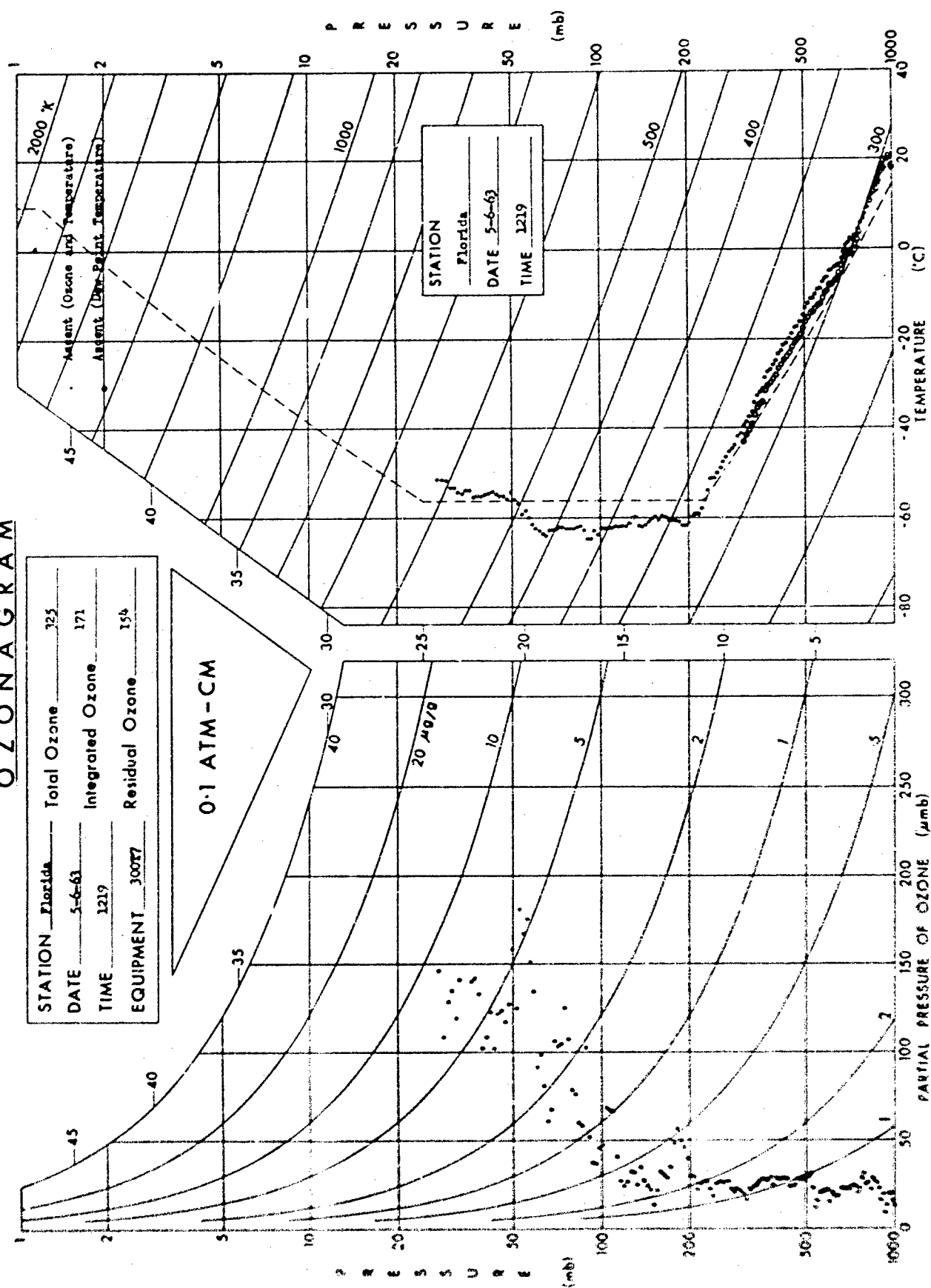
## O Z O N A G R A M



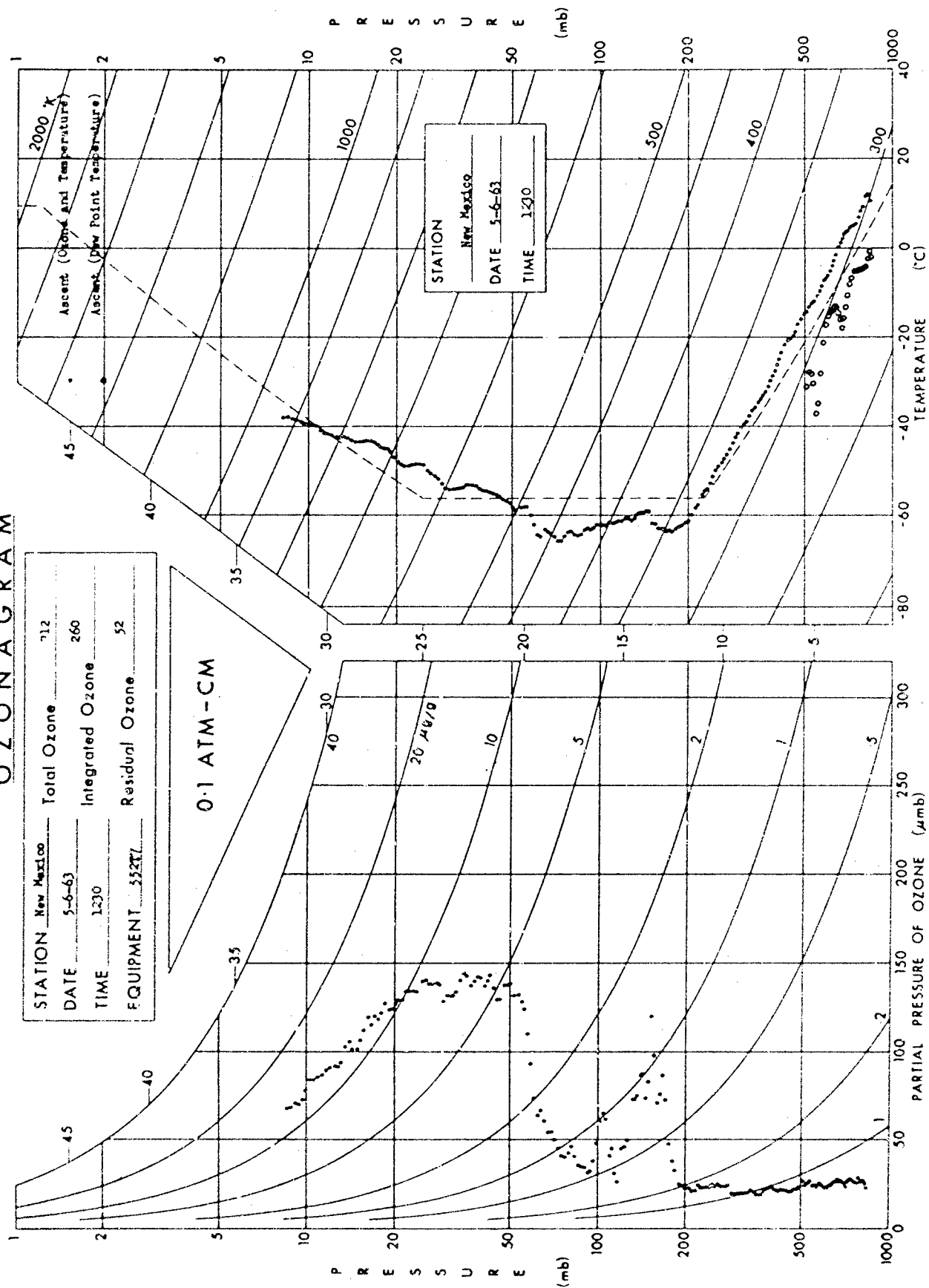
## O Z O N A G R A M

STATION Florida Total Ozone 325  
 DATE 5-6-63 Integrated Ozone 171  
 TIME 1219 Residual Ozone 154  
 EQUIPMENT 30077

0.1 ATM-CM

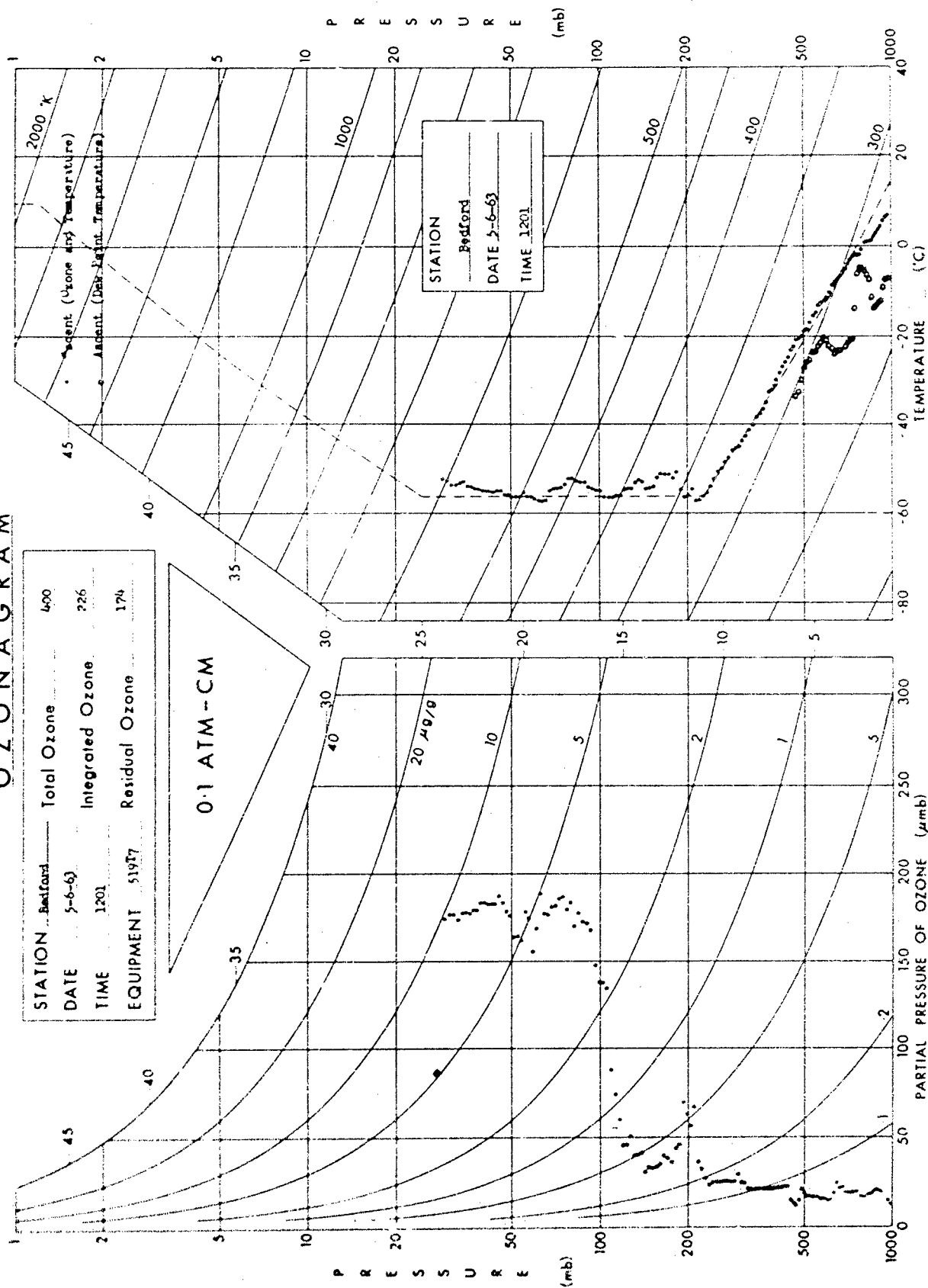


## OZONAGRAM

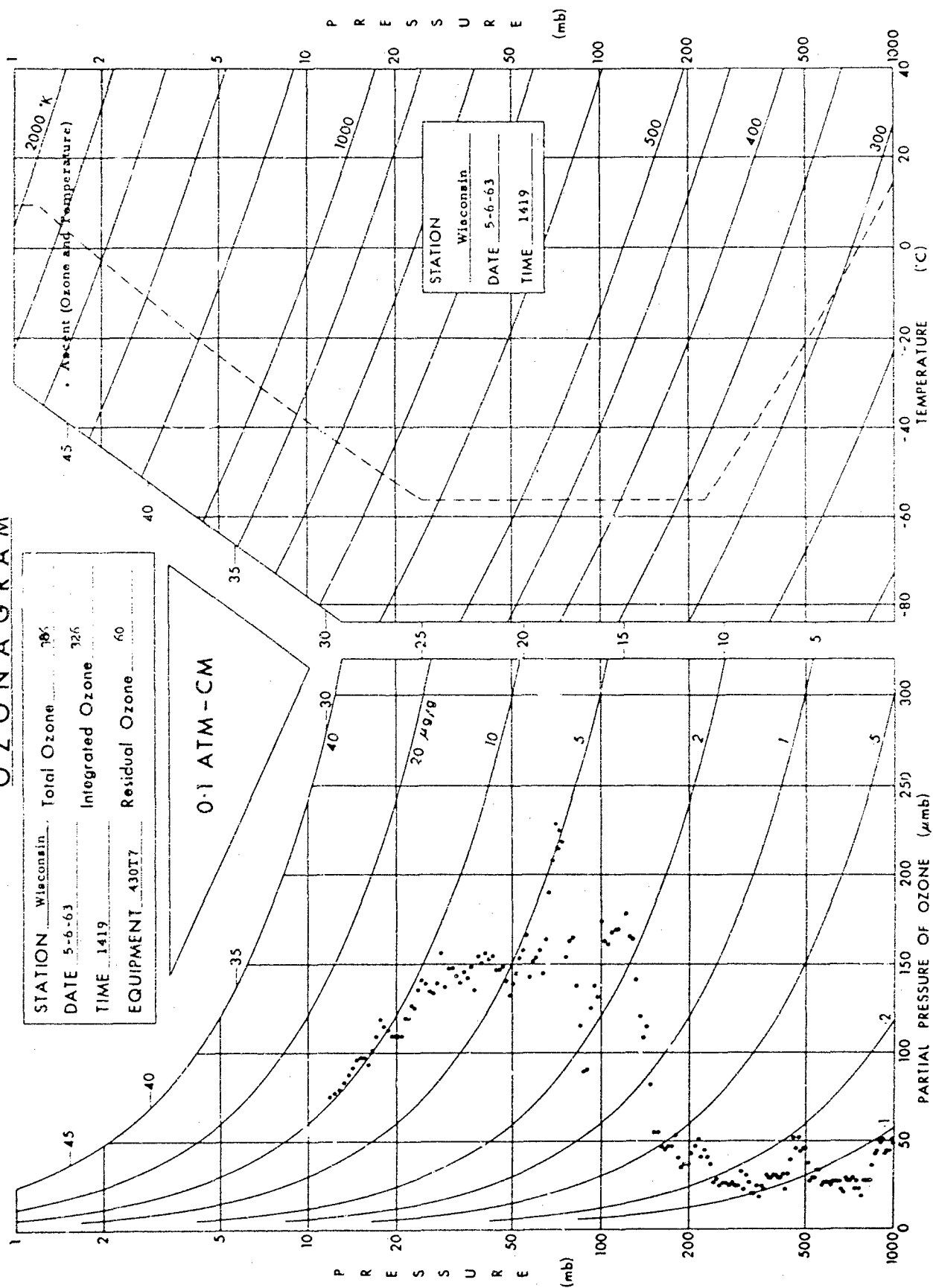




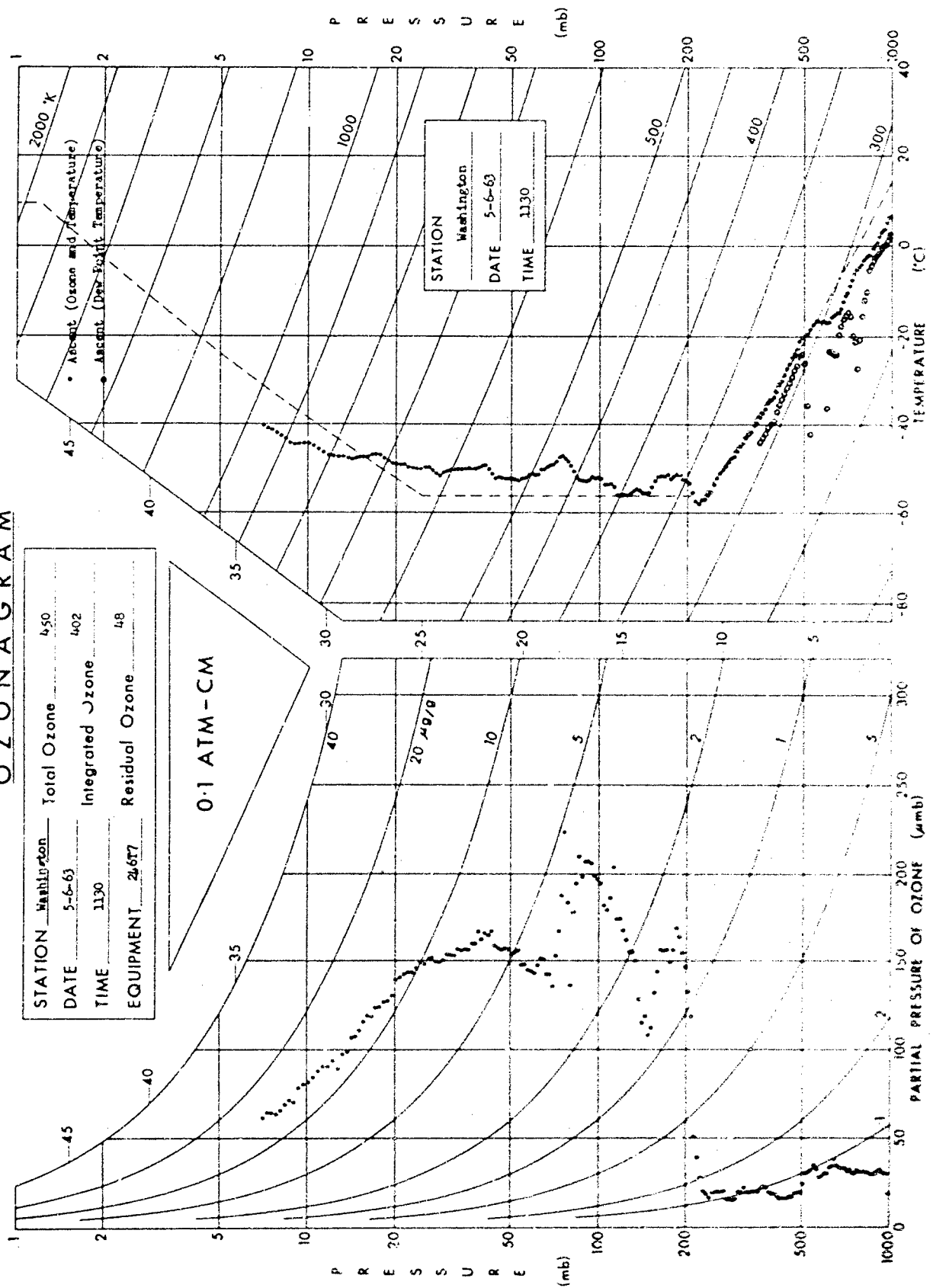
## O Z O N A G R A M



## OZONAGRAM

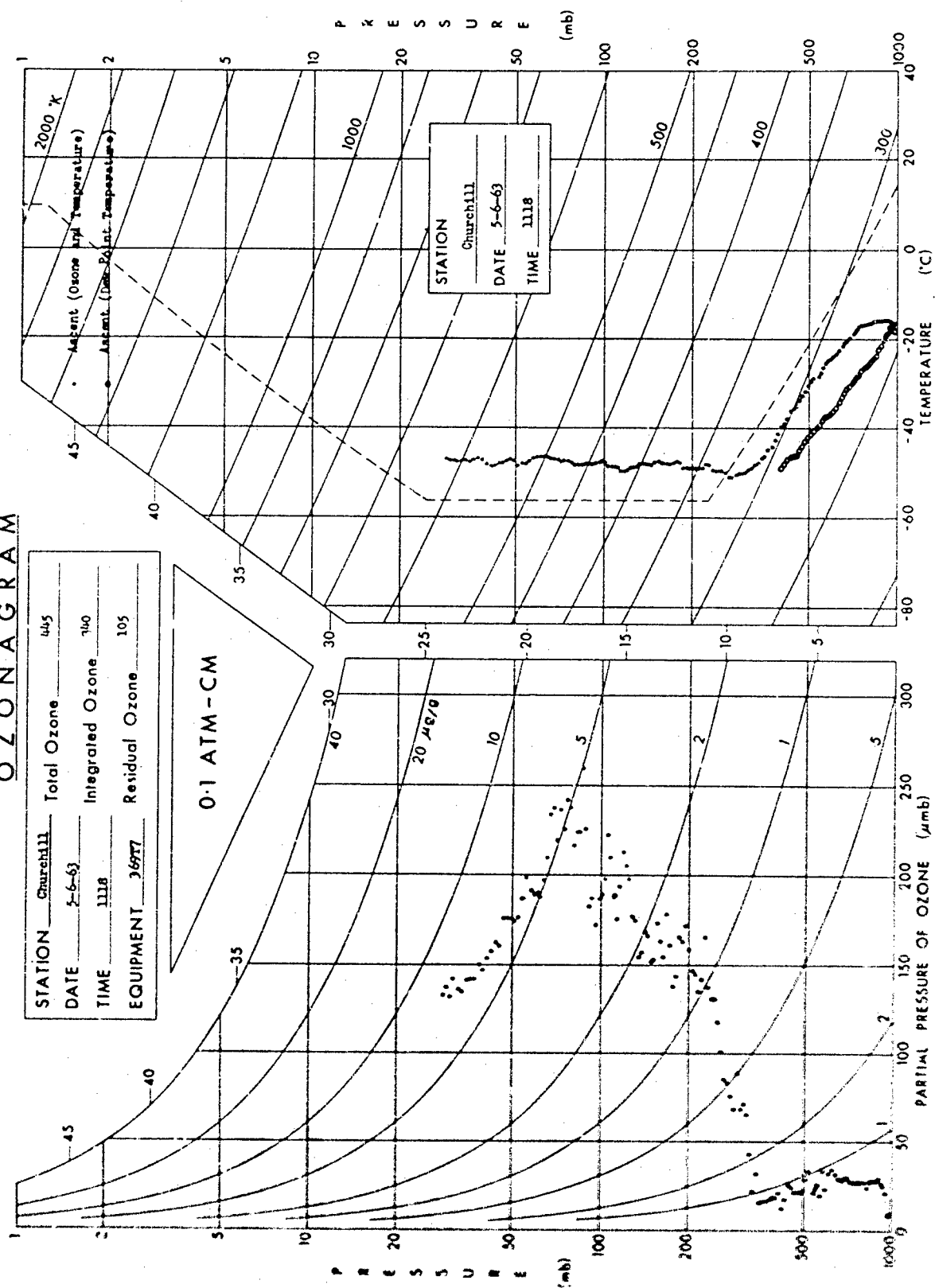


## OZONAGRAM

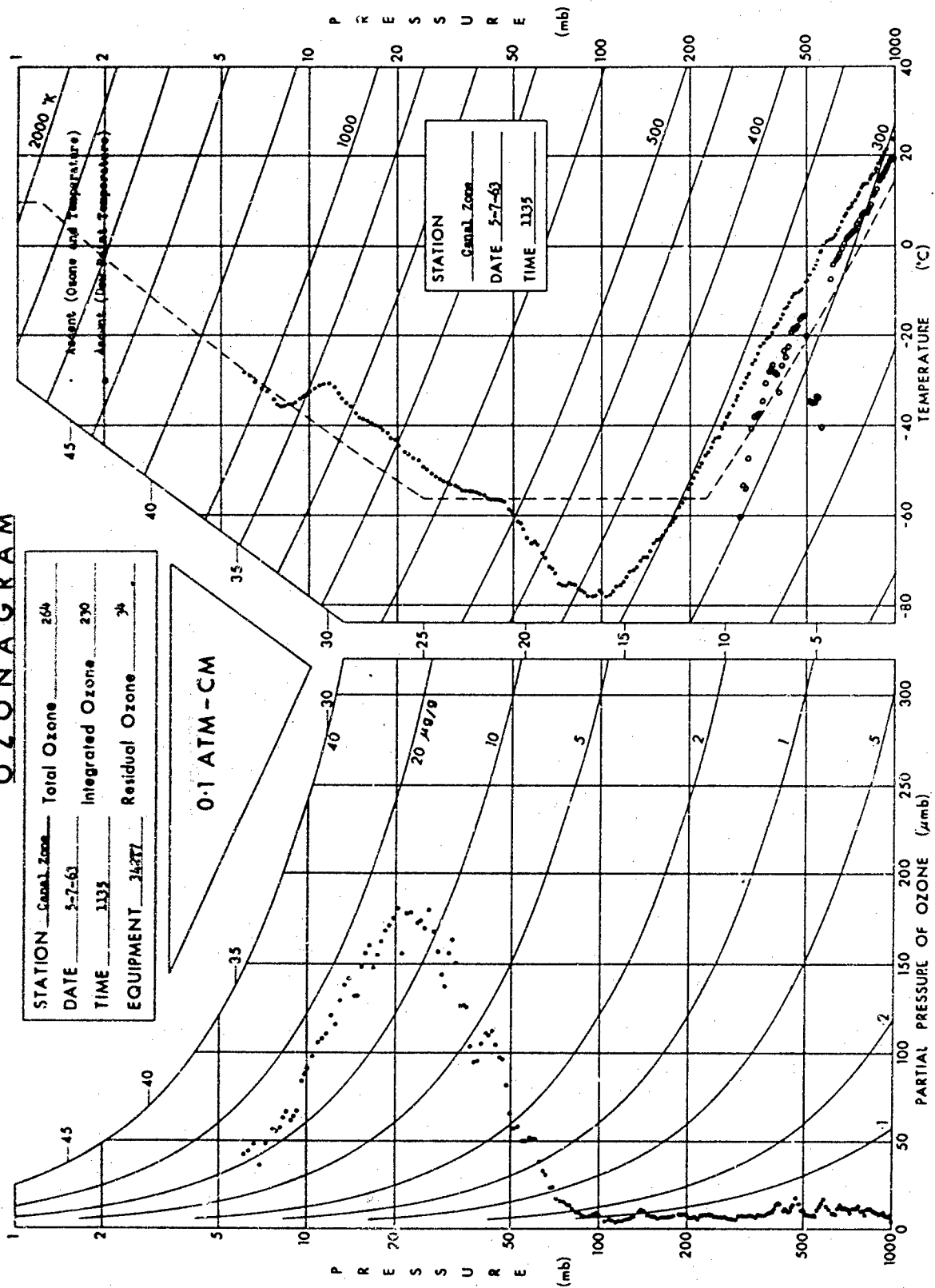




## O Z O N A G R A M



## O Z O N A G R A M

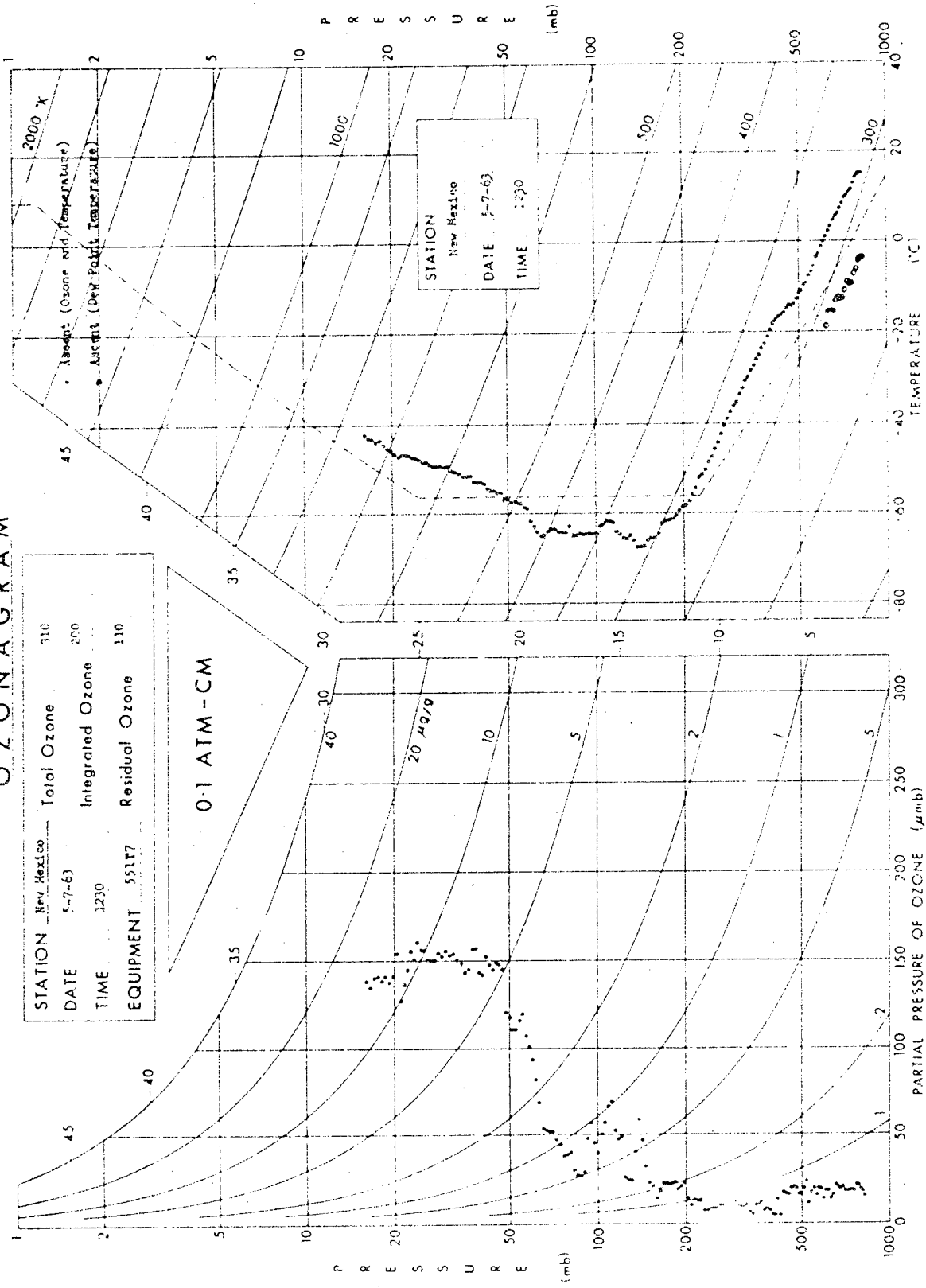




# OZONAGRAM

STATION	New Mexico	Total Ozone	310
DATE	5-7-63	Integrated Ozone	200
TIME	1230	Residual Ozone	110
EQUIPMENT	5517		

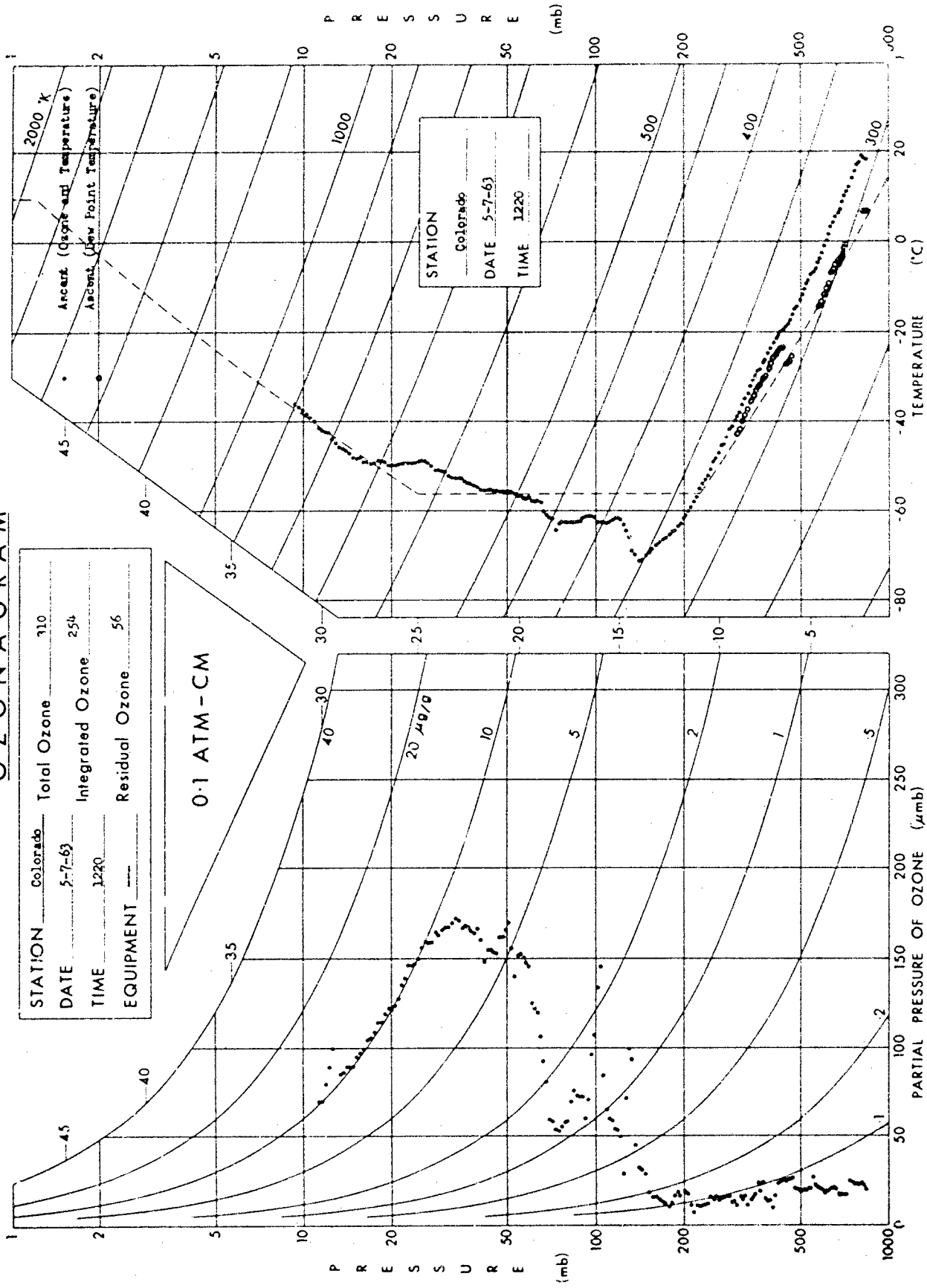
0.1 ATM-CM



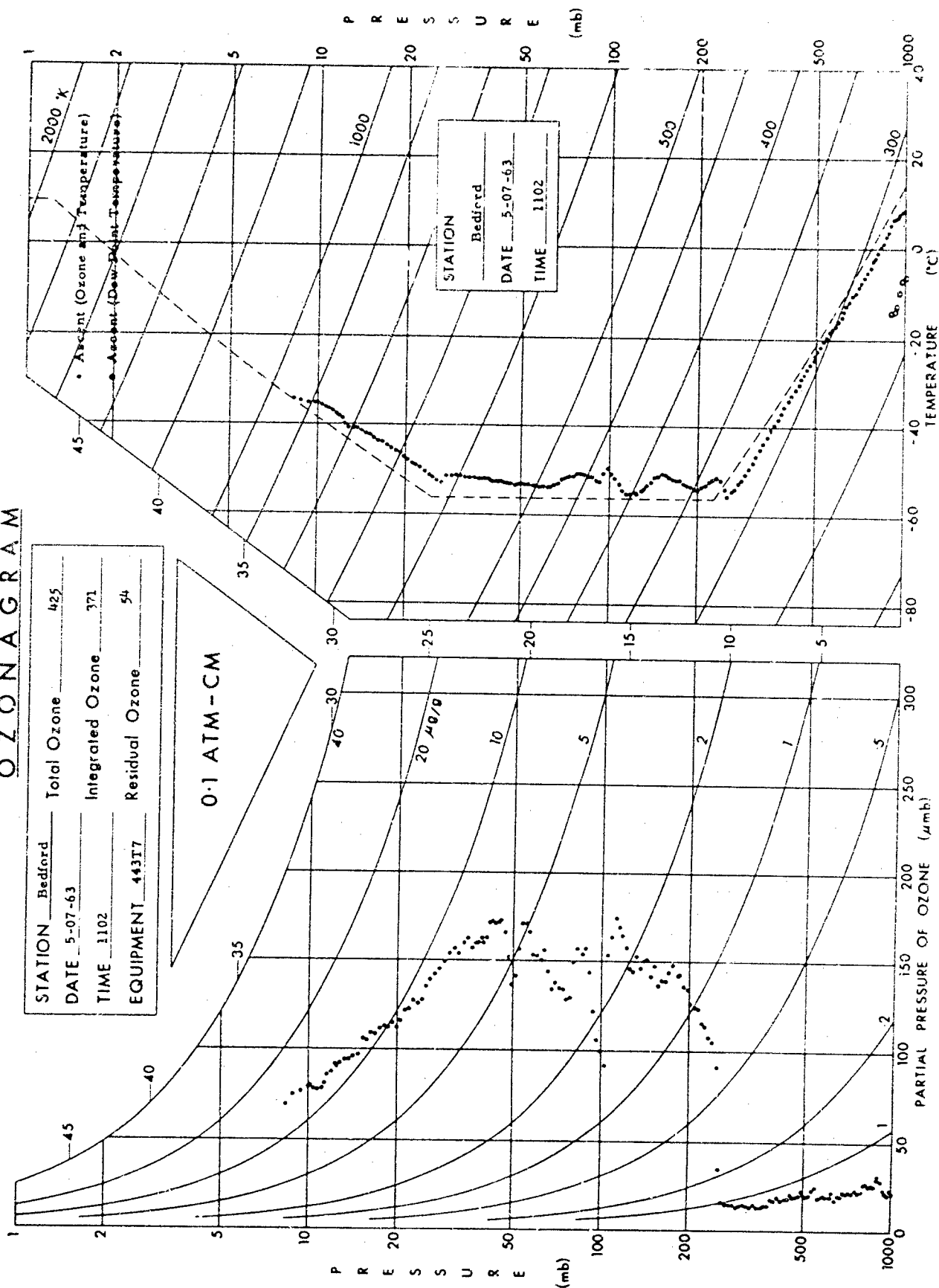
# O Z O N A G R A M

STATION	Colorado	Total Ozone	110
DATE	5-7-63	Integrated Ozone	254
TIME	1220	Residual Ozone	56
EQUIPMENT	---		

0.1 ATM-CM



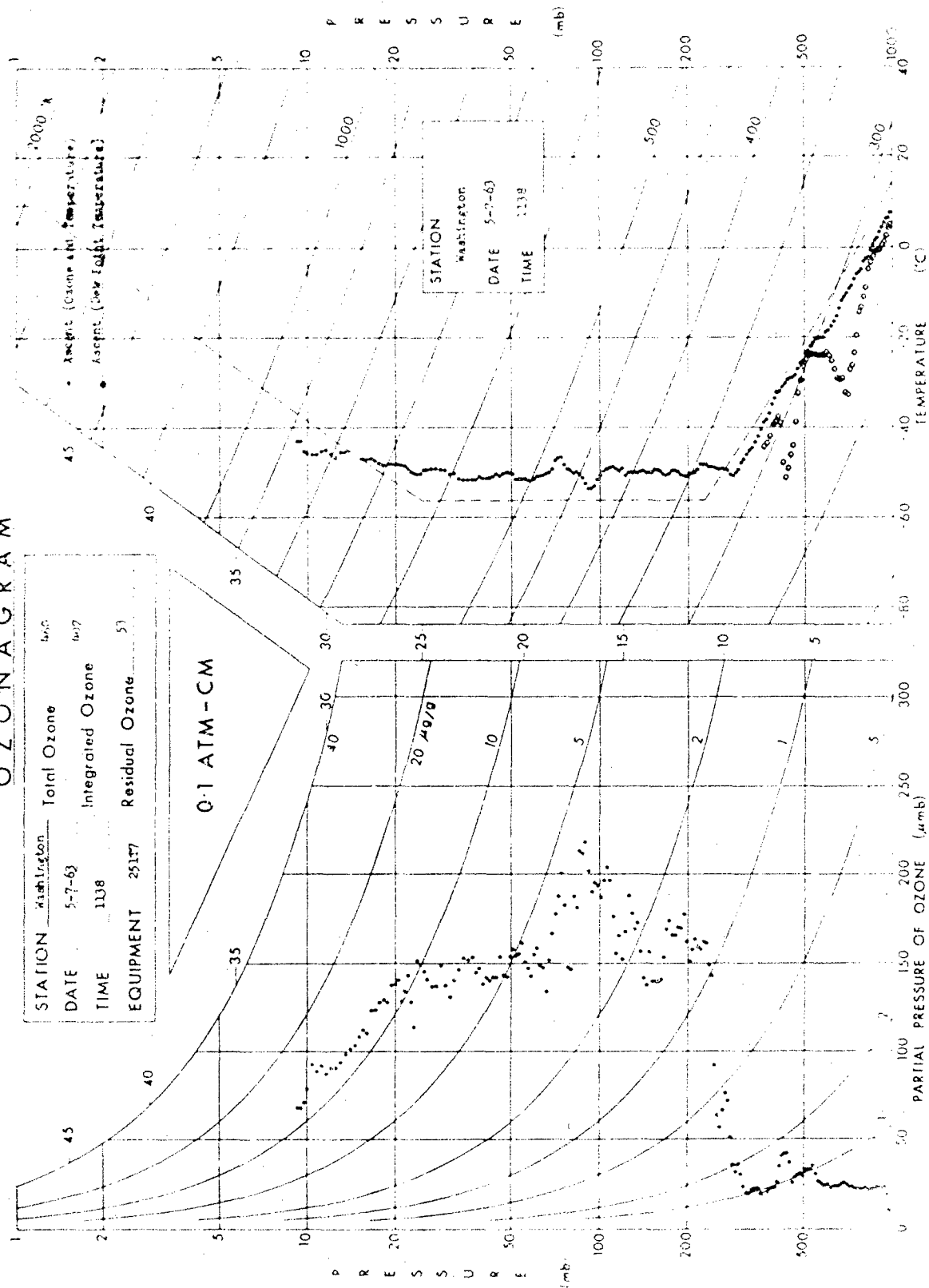
## OZONAGRAM



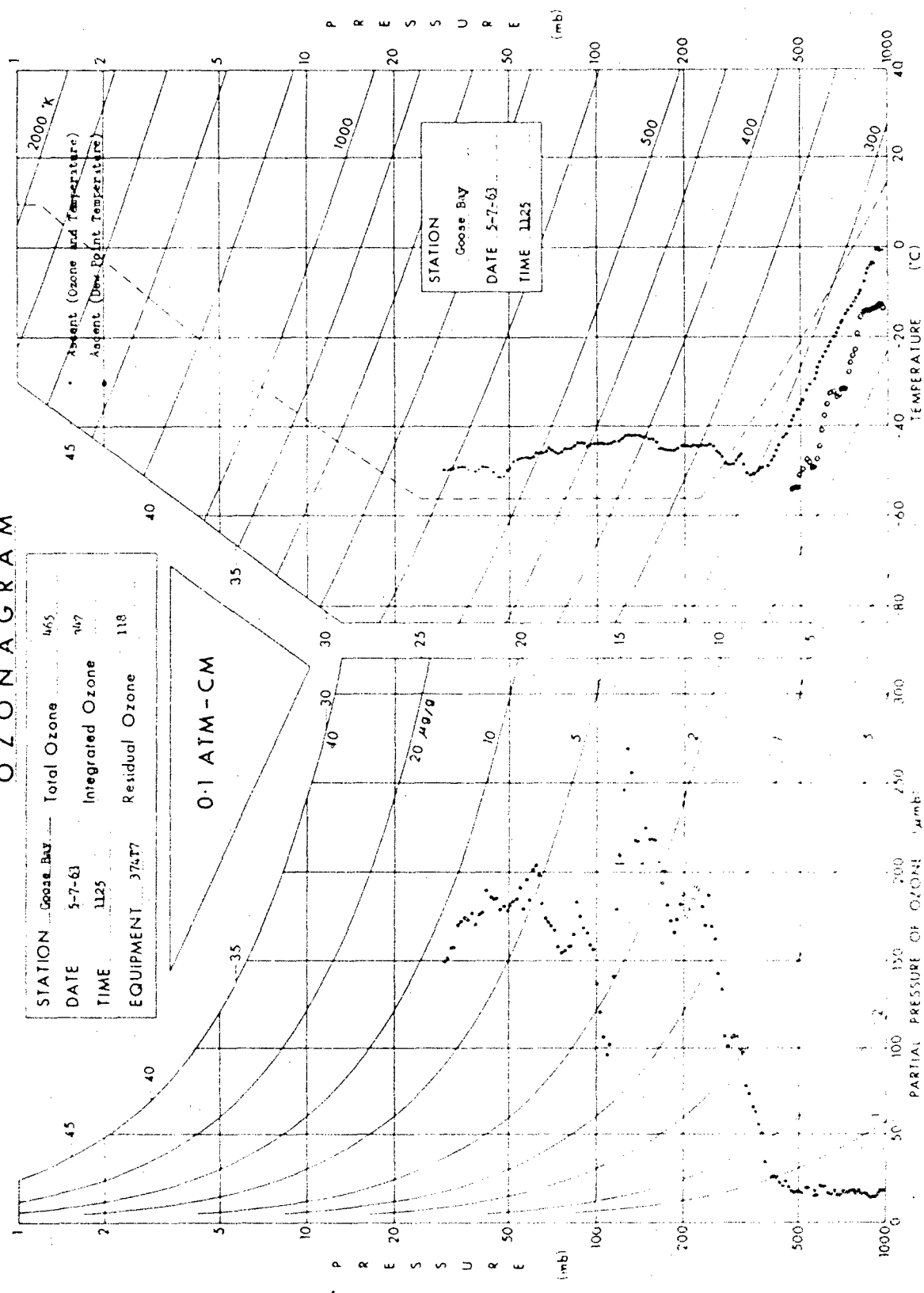
## OZONAGRAM

STATION	Washington	Total Ozone	442
DATE	5-7-63	Integrated Ozone	147
TIME	1108	Residual Ozone	53
EQUIPMENT	25177		

0.1 ATM-CM



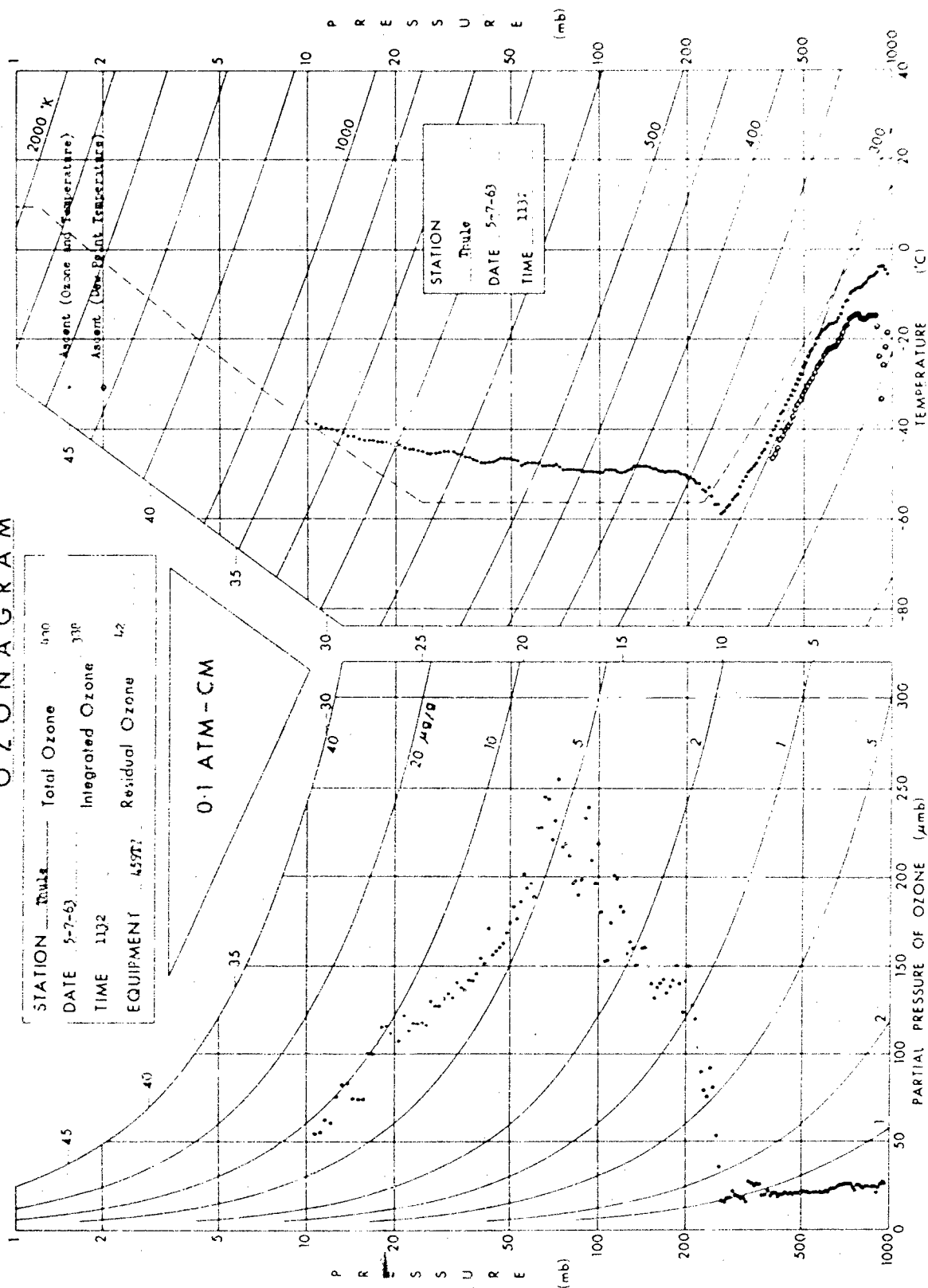
## O Z O N A G R A M







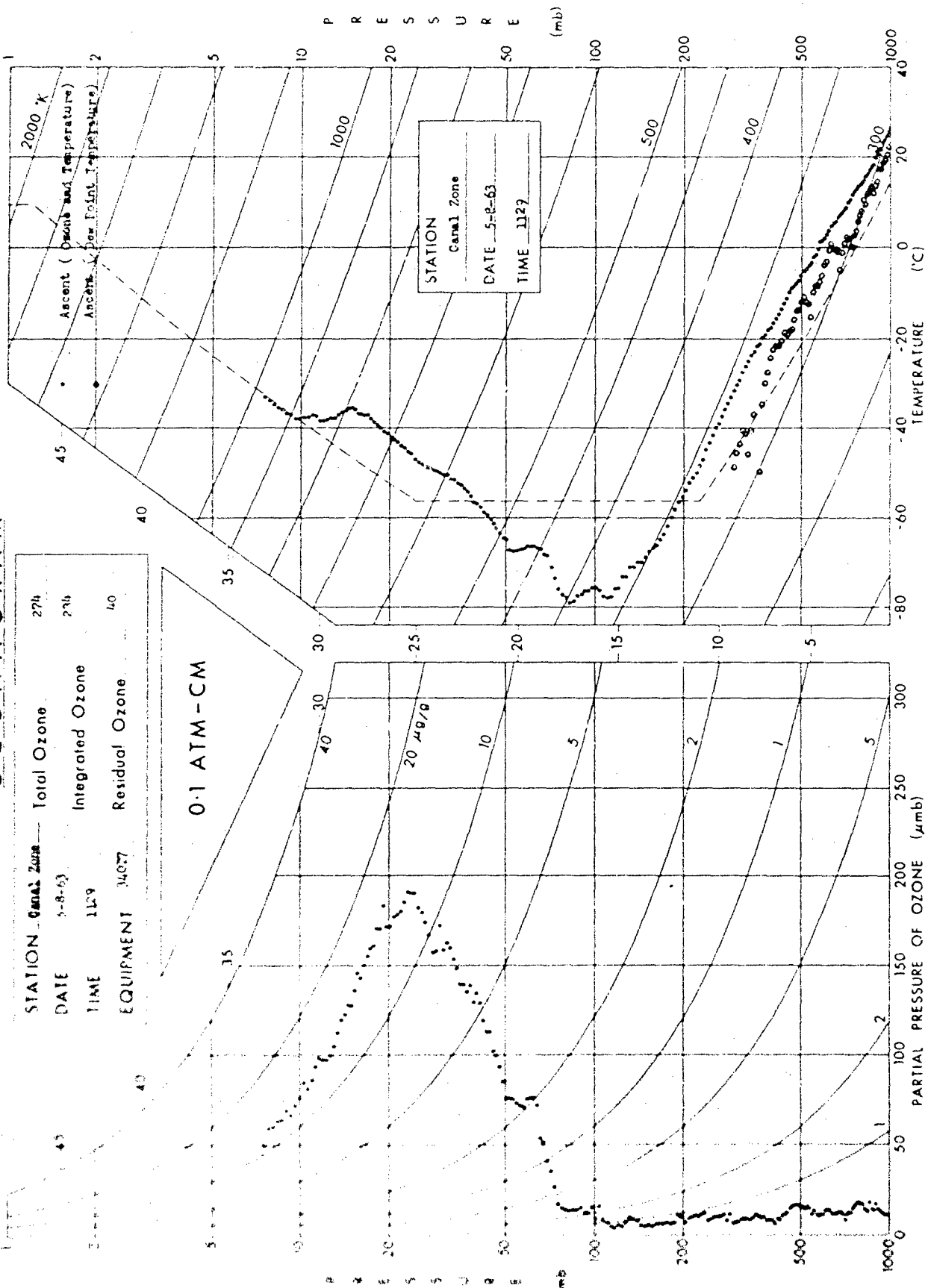
## O Z O N A G R A M



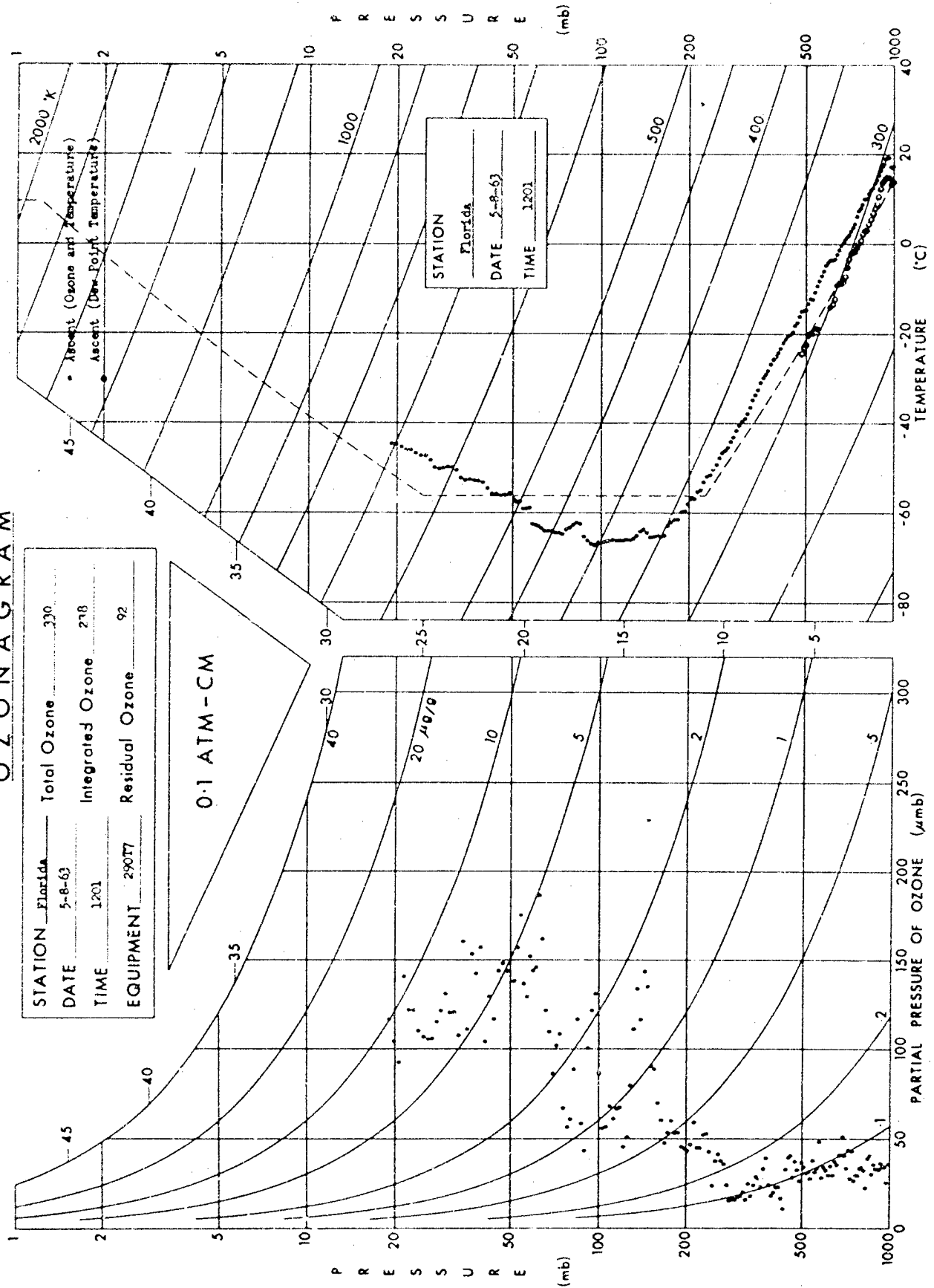
## O Z O N A G R A M

STATION Canal Zone      27h  
 DATE 5-8-63      27h  
 TIME 1129      40  
 EQUIPMENT 3407      Residual Ozone

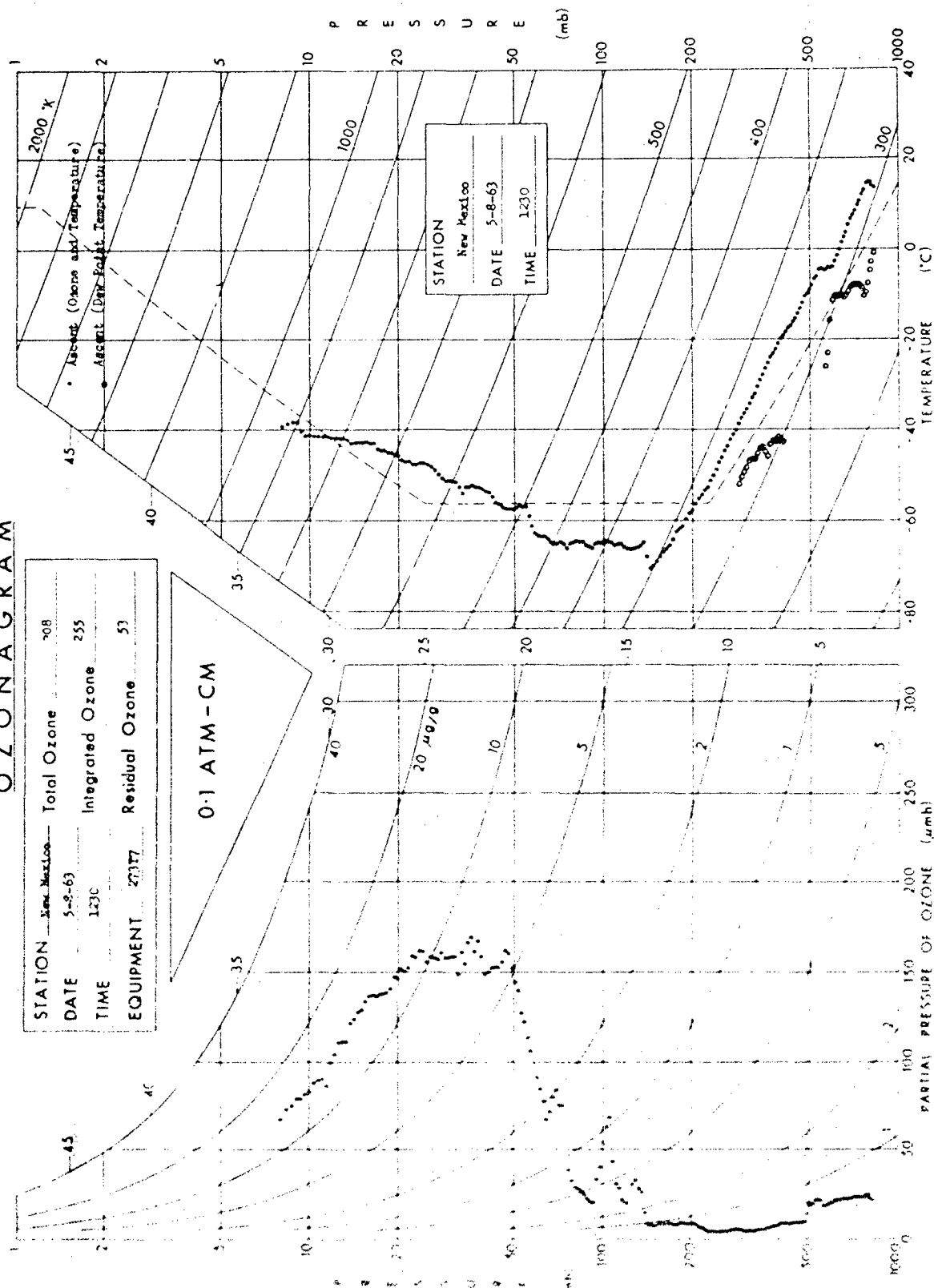
0.1 ATM-CM



## O Z O N A G R A M



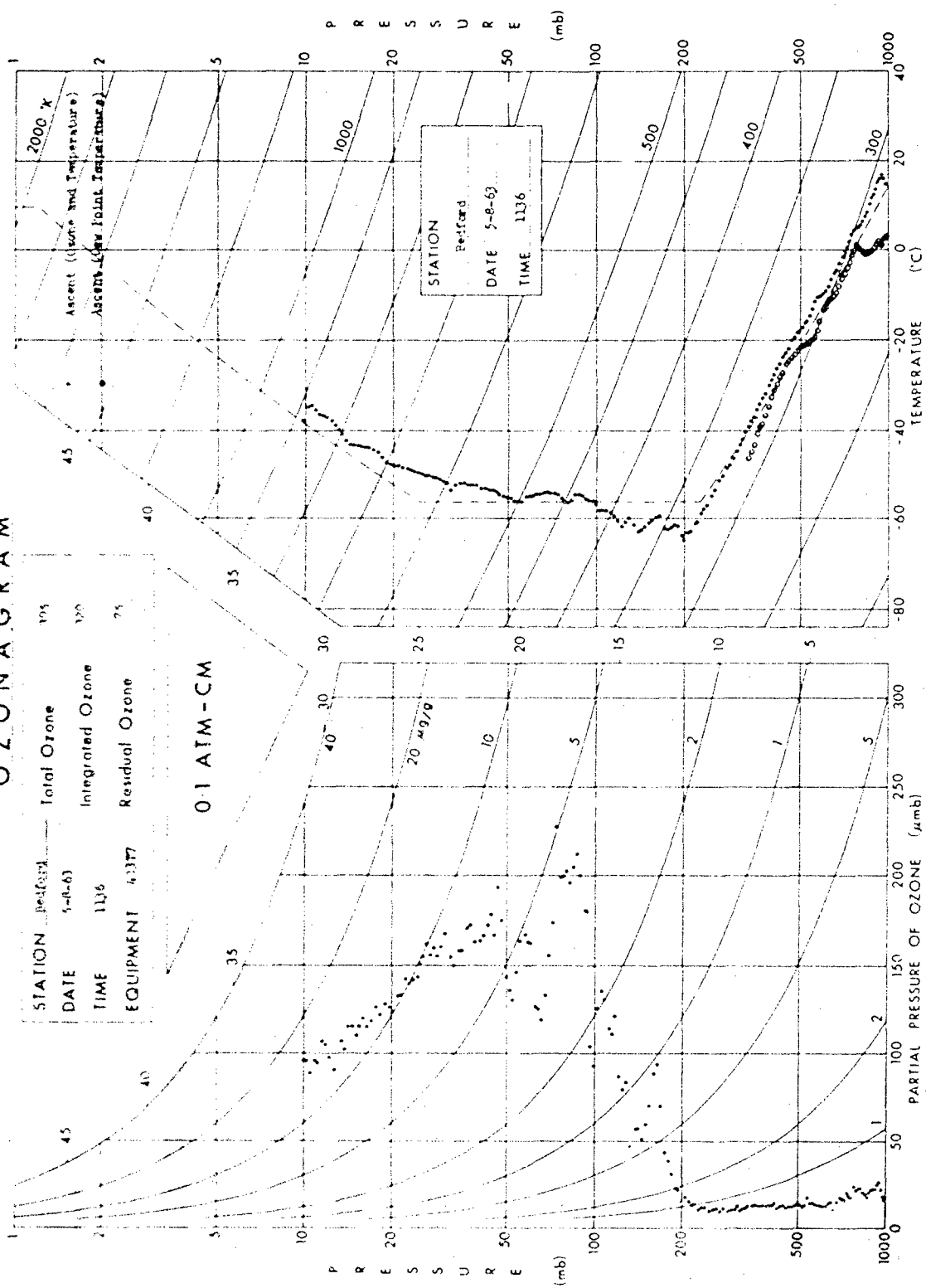
## OZONAGRAM



## OZONAGRAM

STATION Peirford Total Ozone 195  
 DATE 5-8-63 Integrated Ozone 320  
 TIME 1136 Residual Ozone 75  
 EQUIPMENT 43377

0.1 ATM-CM

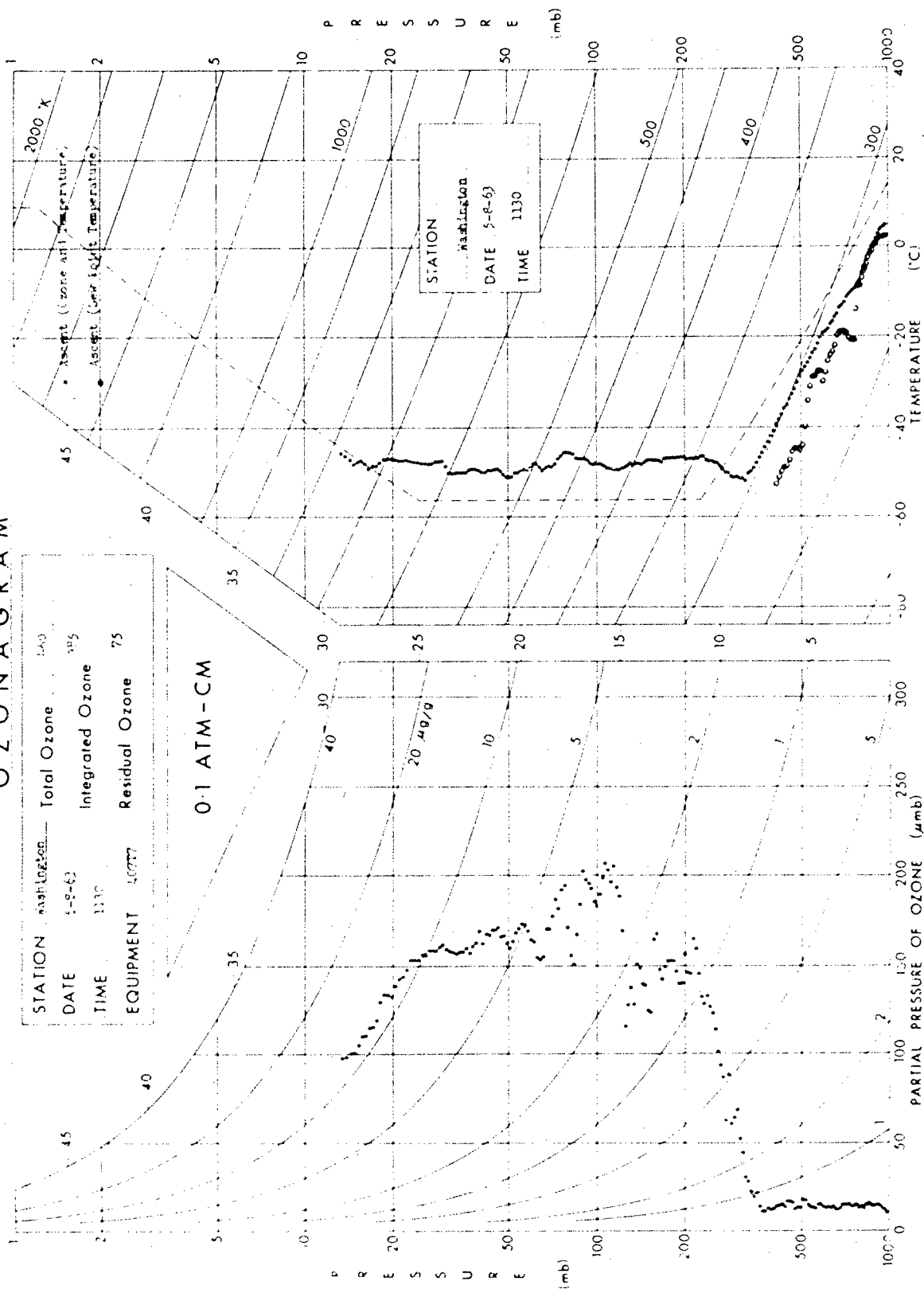


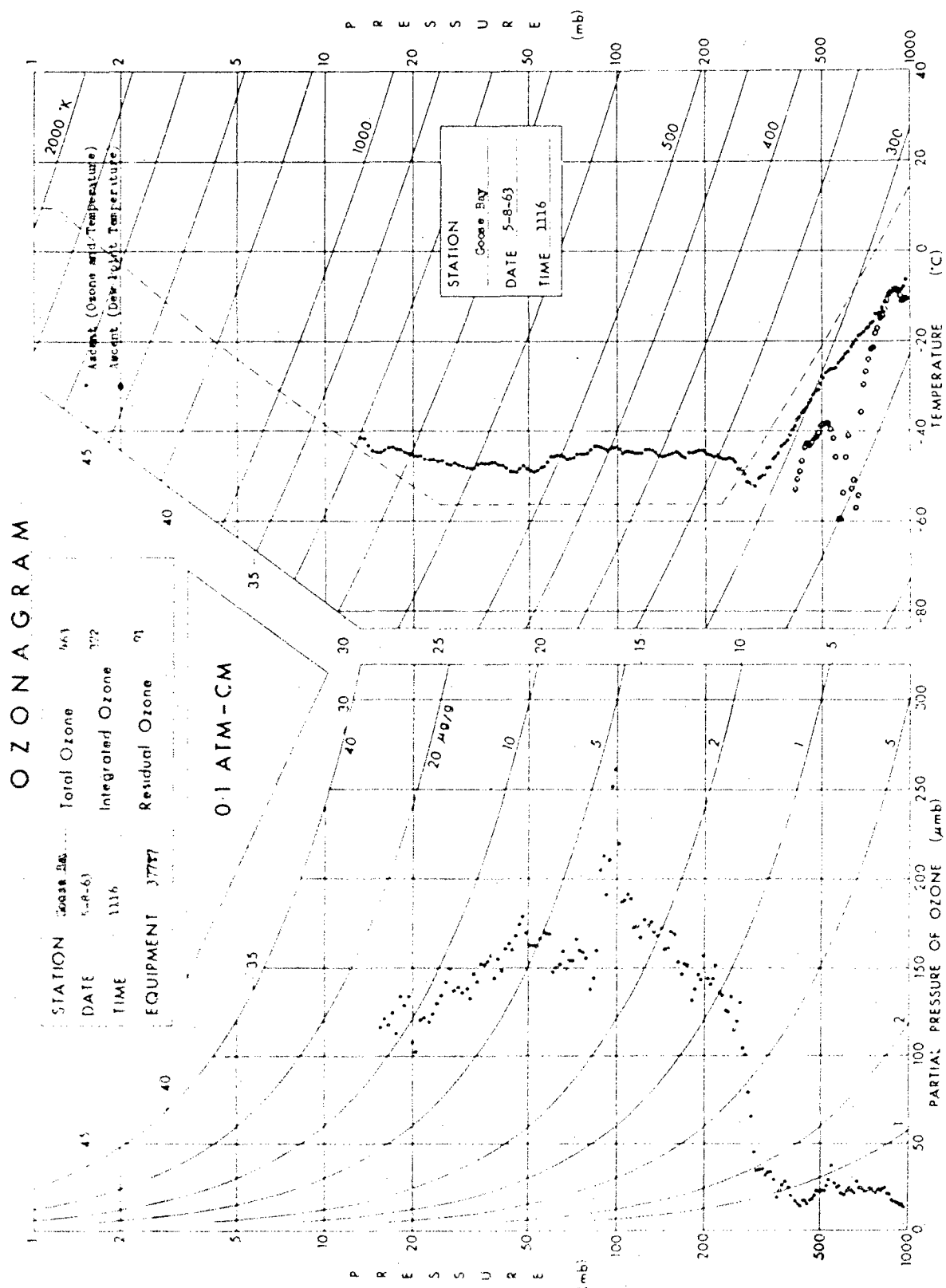
## O Z O N A G R A M

STATION Washington  
 DATE 5-8-63  
 TIME 1130  
 EQUIPMENT 40077

Total Ozone 140  
 Integrated Ozone 105  
 Residual Ozone 75

0.1 ATM-CM



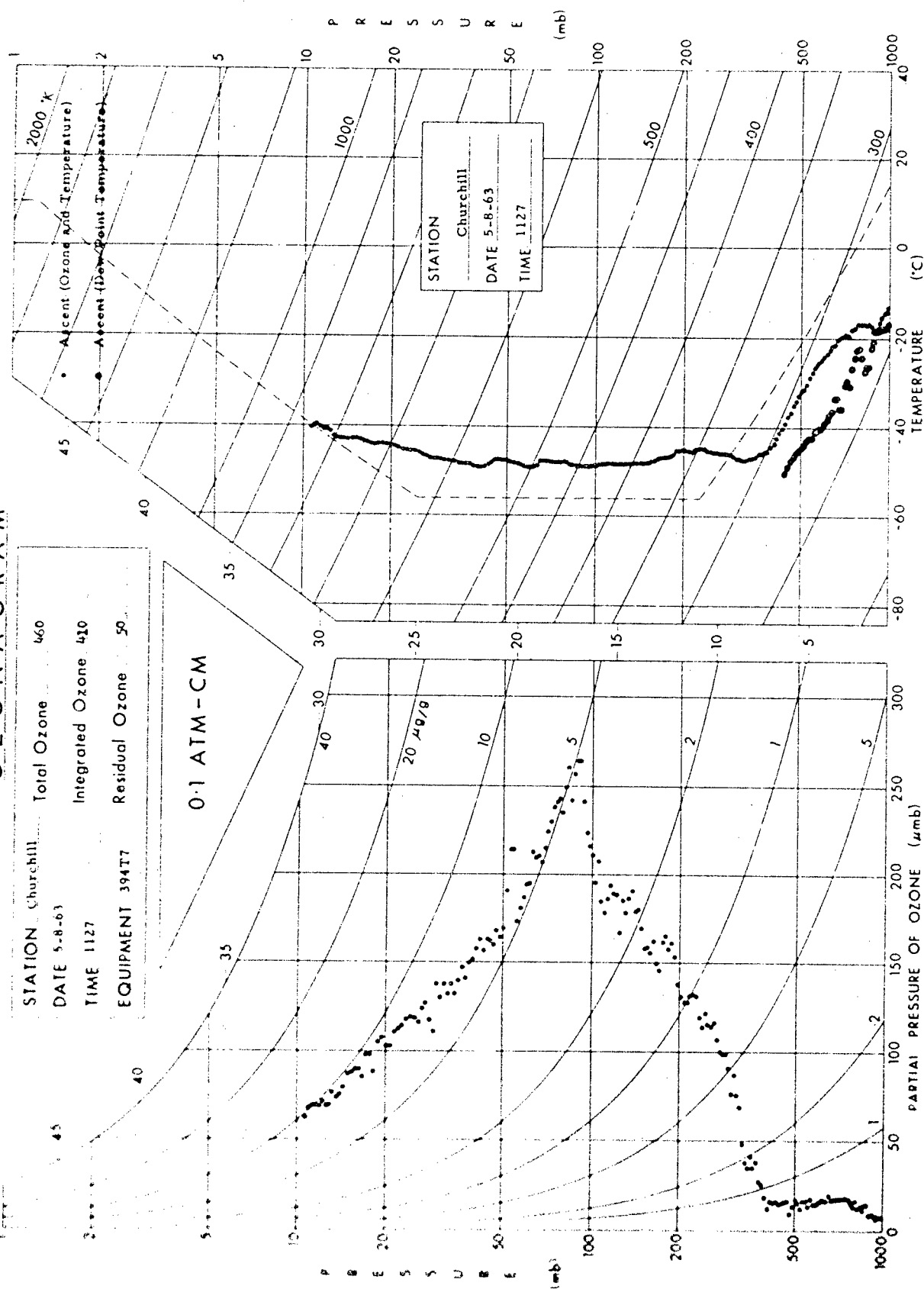




# OZONAGRAM

STATION Churchill  
 DATE 5-8-63  
 TIME 1127  
 EQUIPMENT 394T7  
 Total Ozone 460  
 Integrated Ozone 410  
 Residual Ozone 50

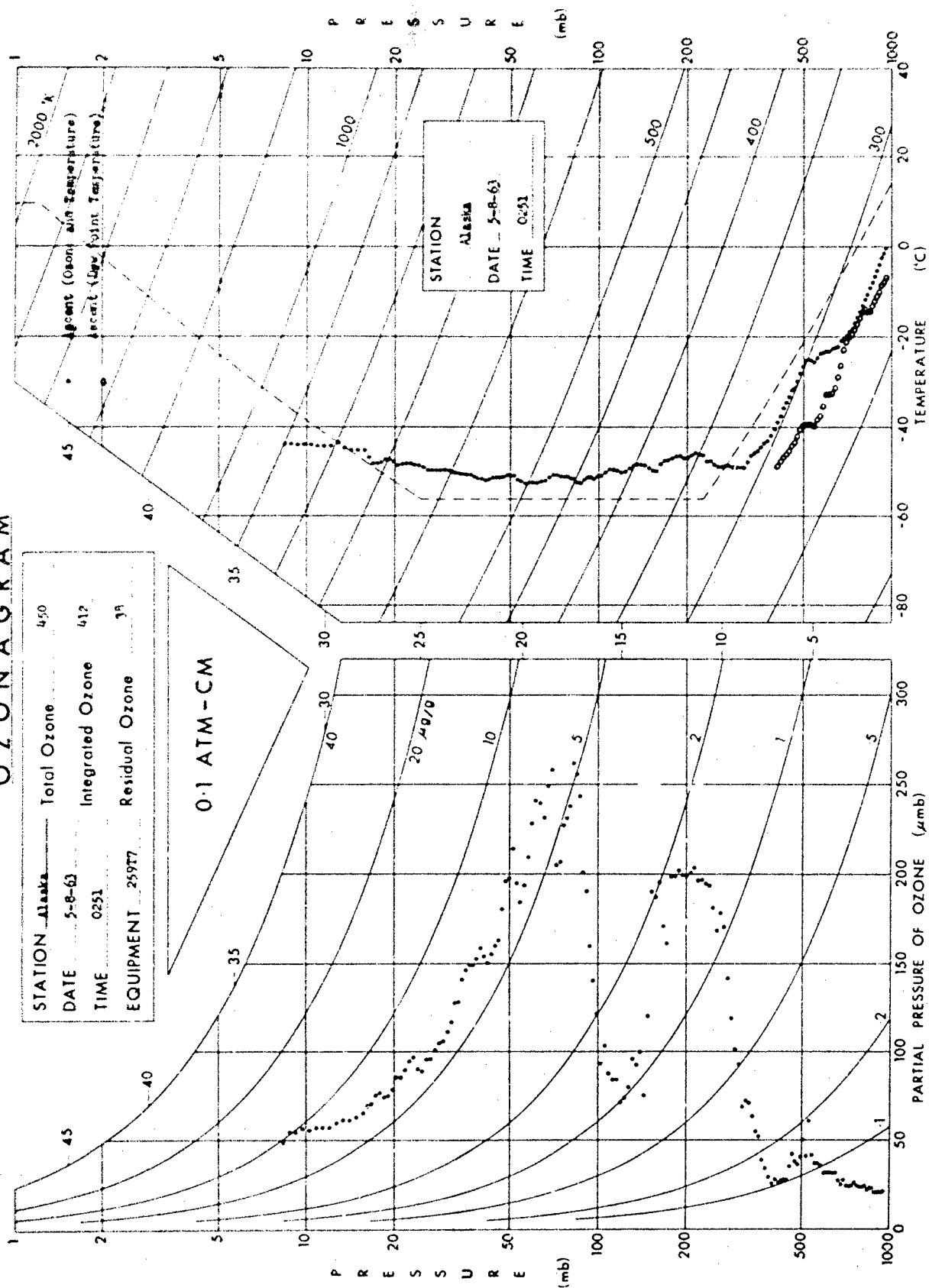
0.1 ATM-CM



## O Z O N A G R A M

STATION Alaska Total Ozone 450  
 DATE 5-8-63 Integrated Ozone 412  
 TIME 0251 Residual Ozone 38  
 EQUIPMENT 25977

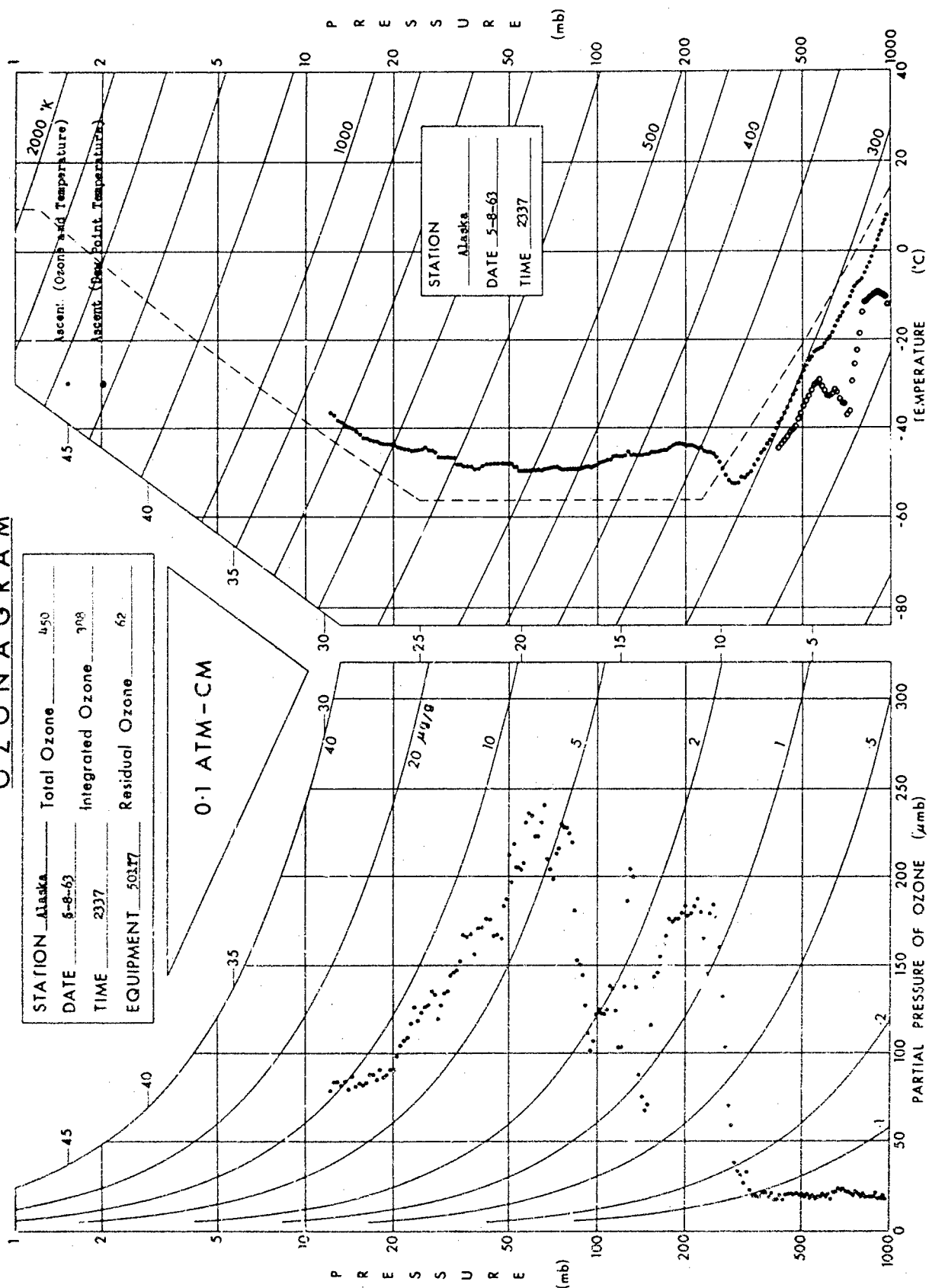
0.1 ATM-CM



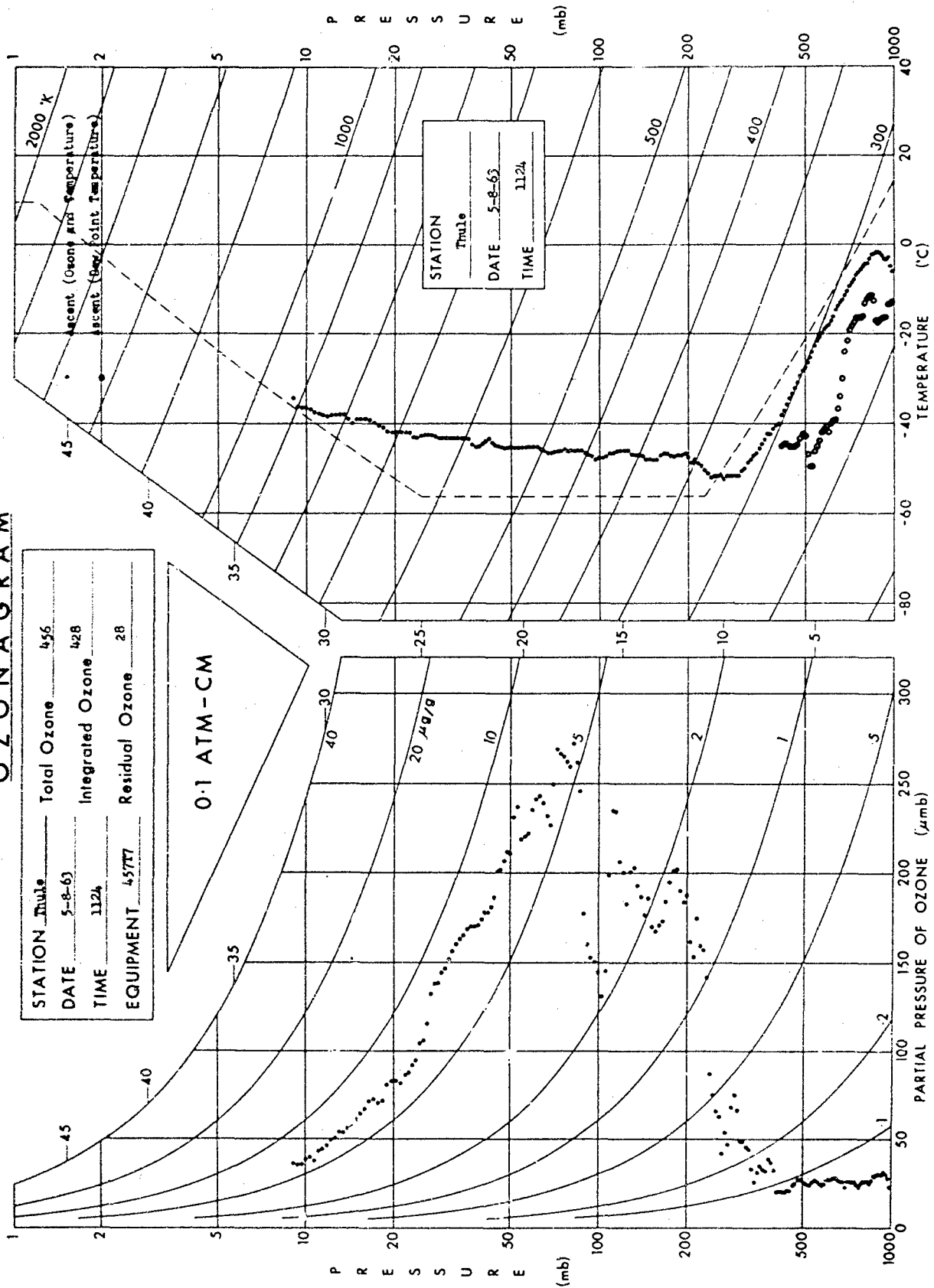
## O Z O N A G R A M

STATION Alaska Total Ozone 450  
 DATE 5-8-63 Integrated Ozone 108  
 TIME 2337 Residual Ozone 62  
 EQUIPMENT 50117

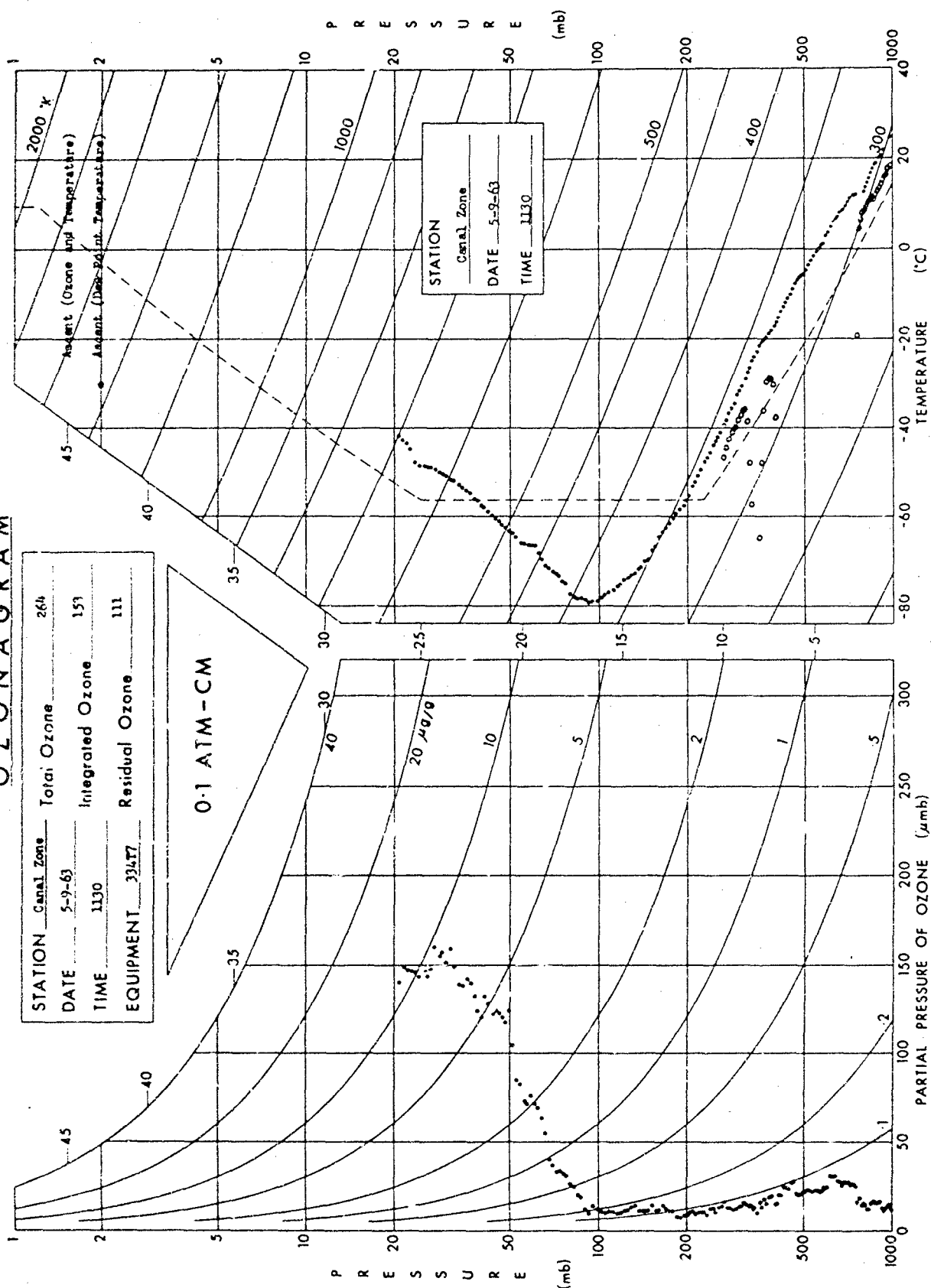
0.1 ATM-CM



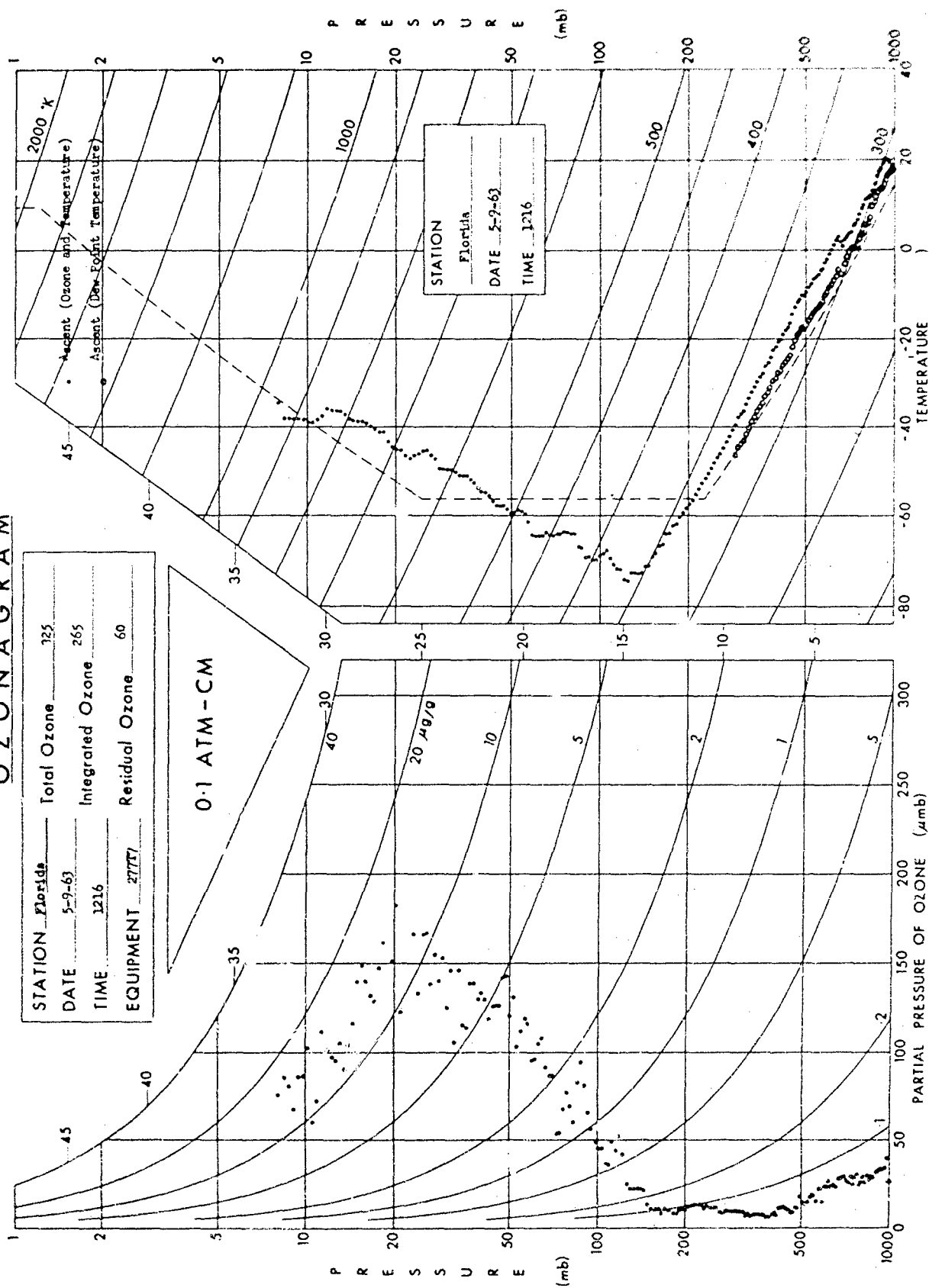
## OZONAGRAM



## O Z O N A G R A M



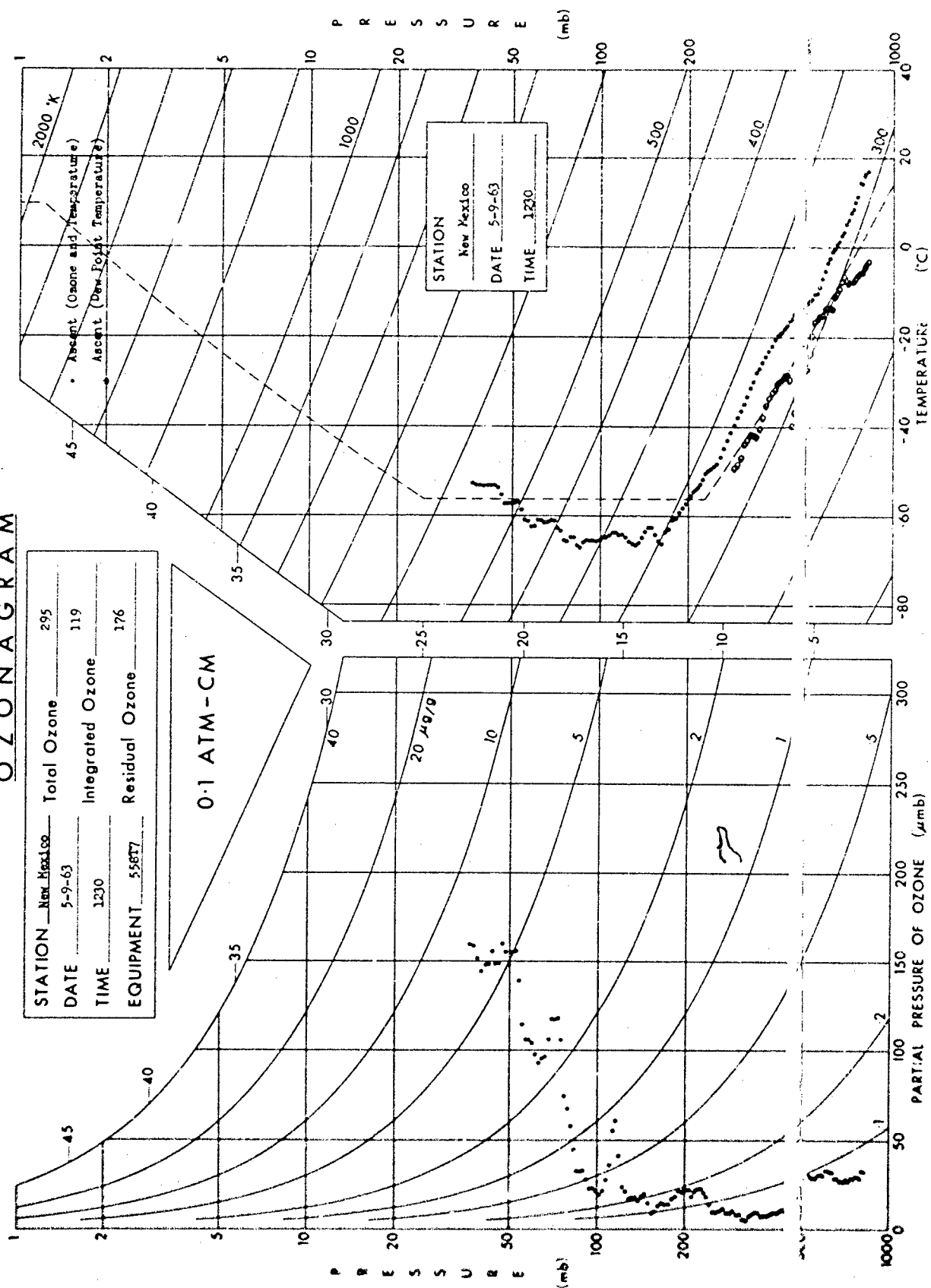
## OZONAGRAM



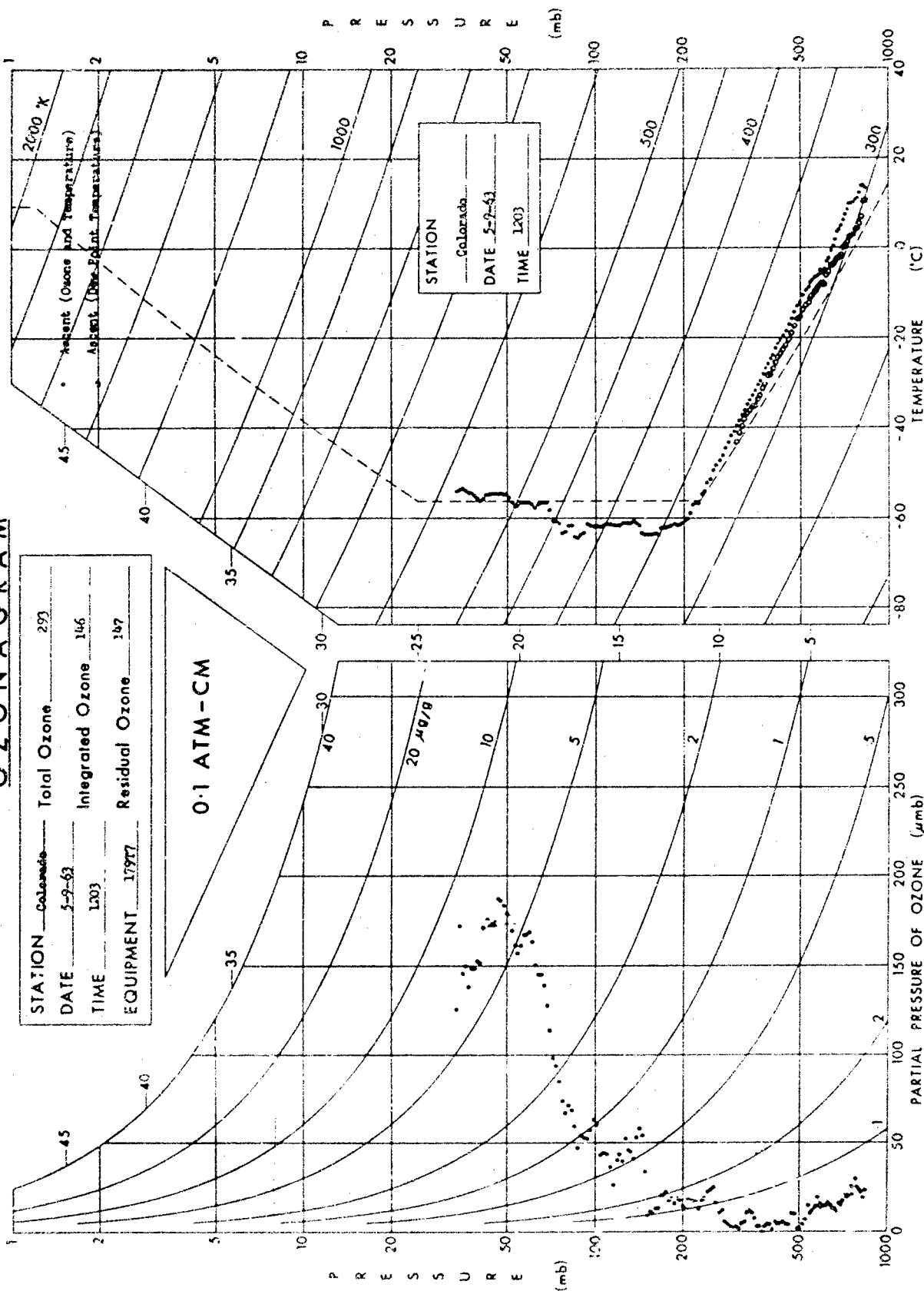
## OZONAGRAM

STATION New Mexico Total Ozone 295  
 DATE 5-9-63 Integrated Ozone 119  
 TIME 1230 Residual Ozone 176  
 EQUIPMENT 55877

0.1 ATM-CM



## OZONAGRAM

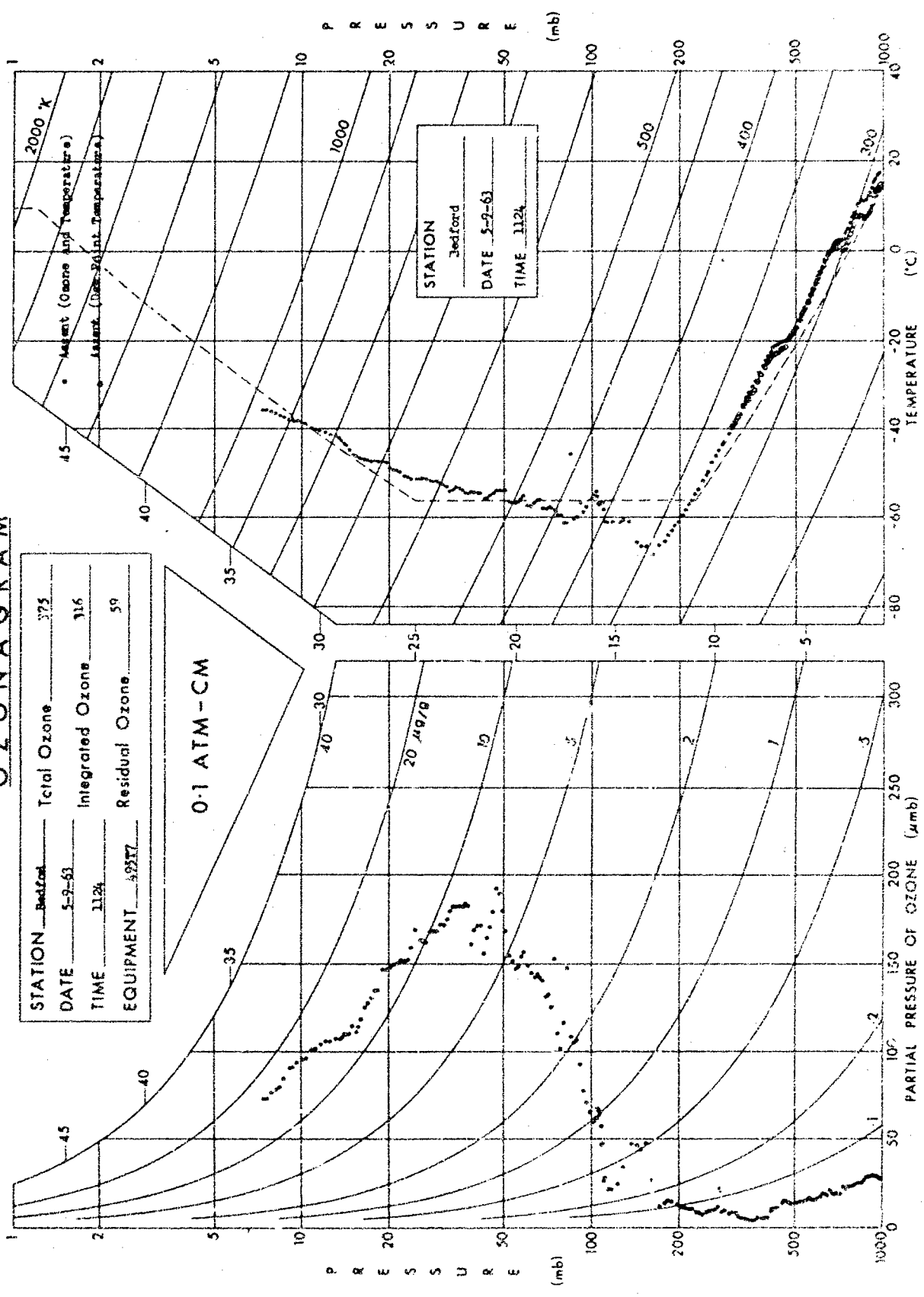




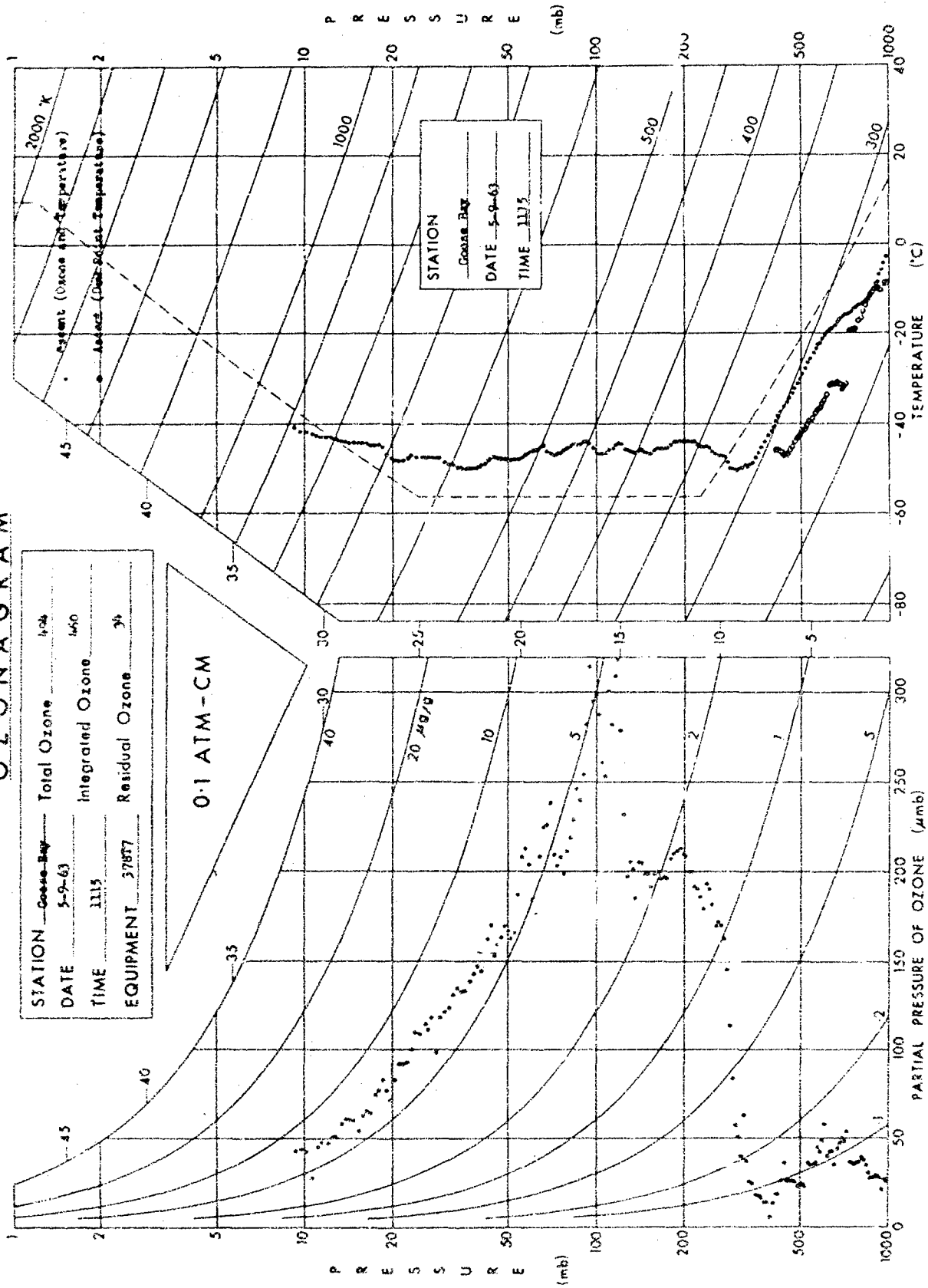
# OZONAGRAM

STATION	Bedford	Total Ozone	375
DATE	5-9-61	Integrated Ozone	316
TIME	1124	Residual Ozone	59
EQUIPMENT	4917		

0.1 ATM-CM



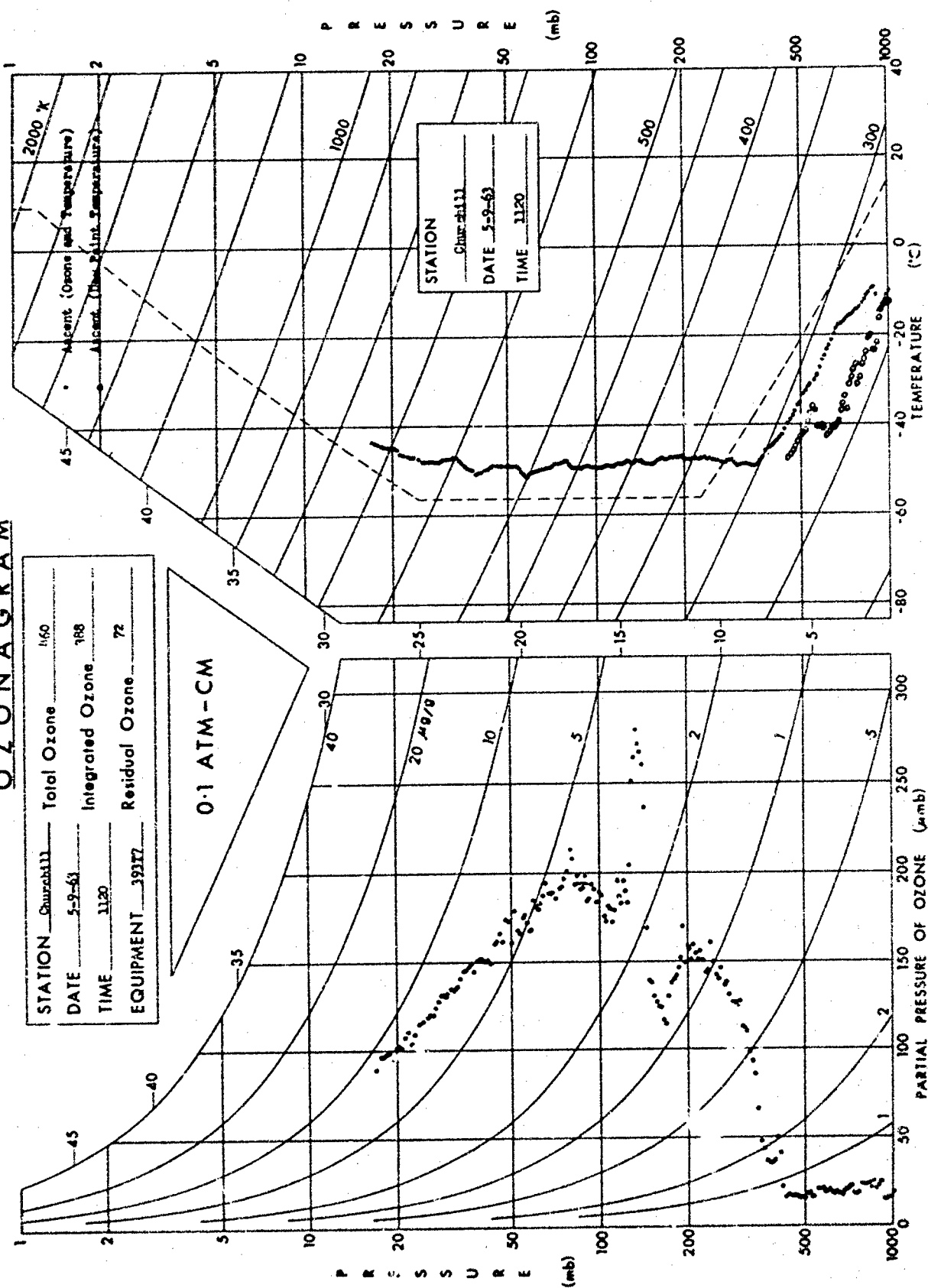
## O Z O N A G R A M

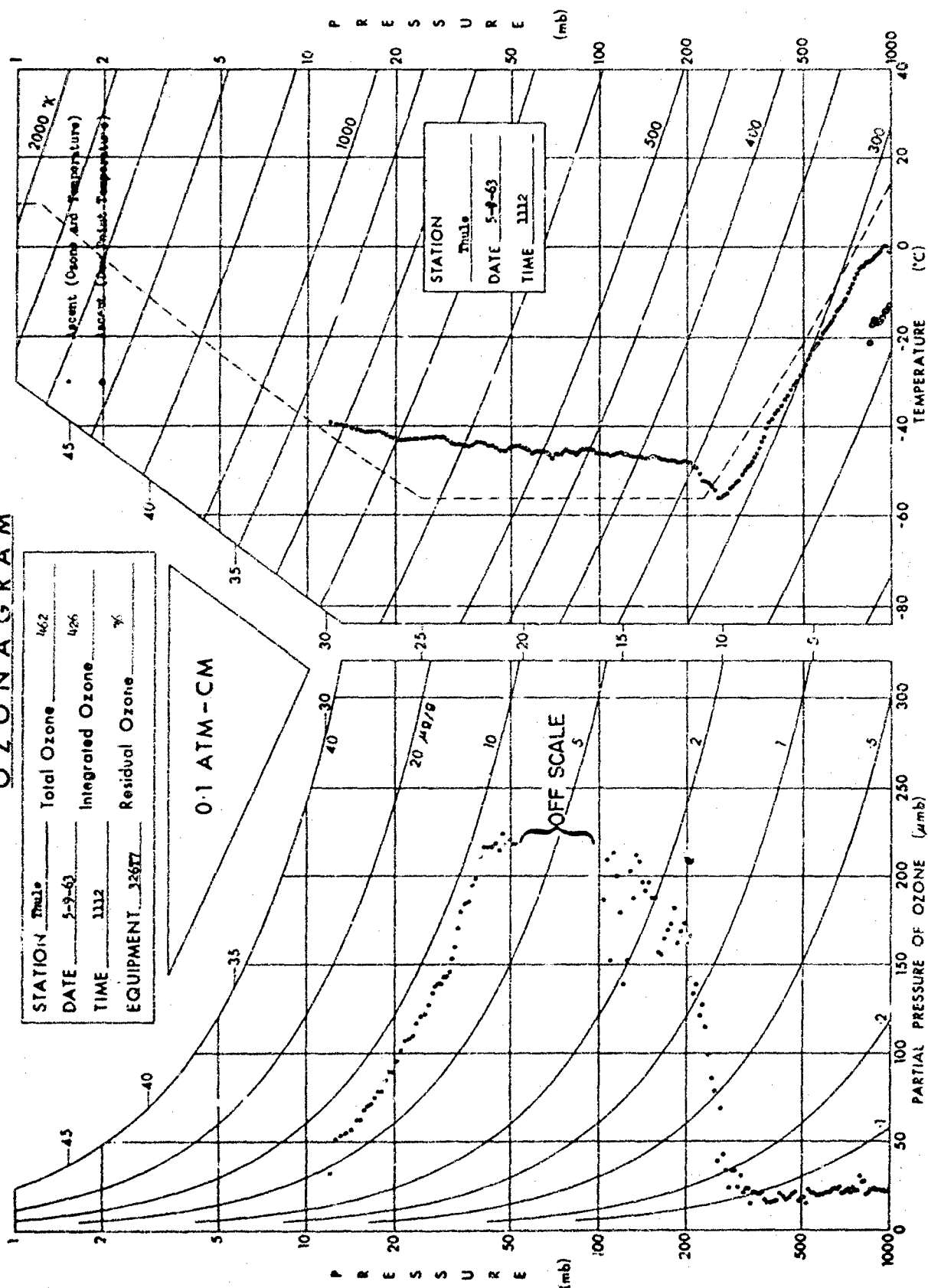


## O Z O N A G R A M

STATION Quarrell Total Ozone 1450  
 DATE 5-9-63 Integrated Ozone 188  
 TIME 1120 Residual Ozone 72  
 EQUIPMENT 19377

0.1 ATM-CM

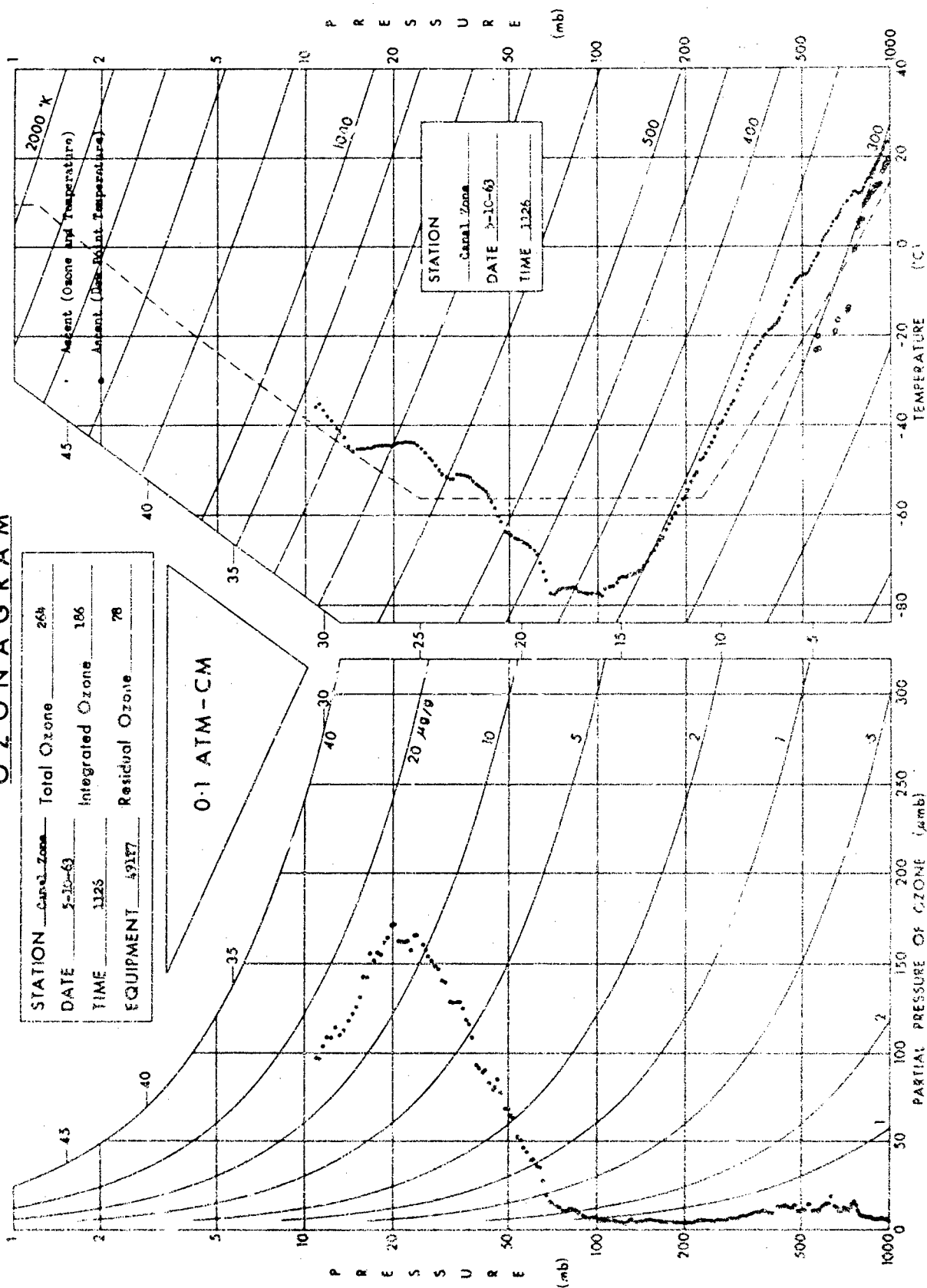




# OZONAGRAM

STATION	Canal Zone	Total Ozone	264
DATE	5-10-63	Integrated Ozone	186
TIME	1126	Residual Ozone	78
EQUIPMENT	49187		

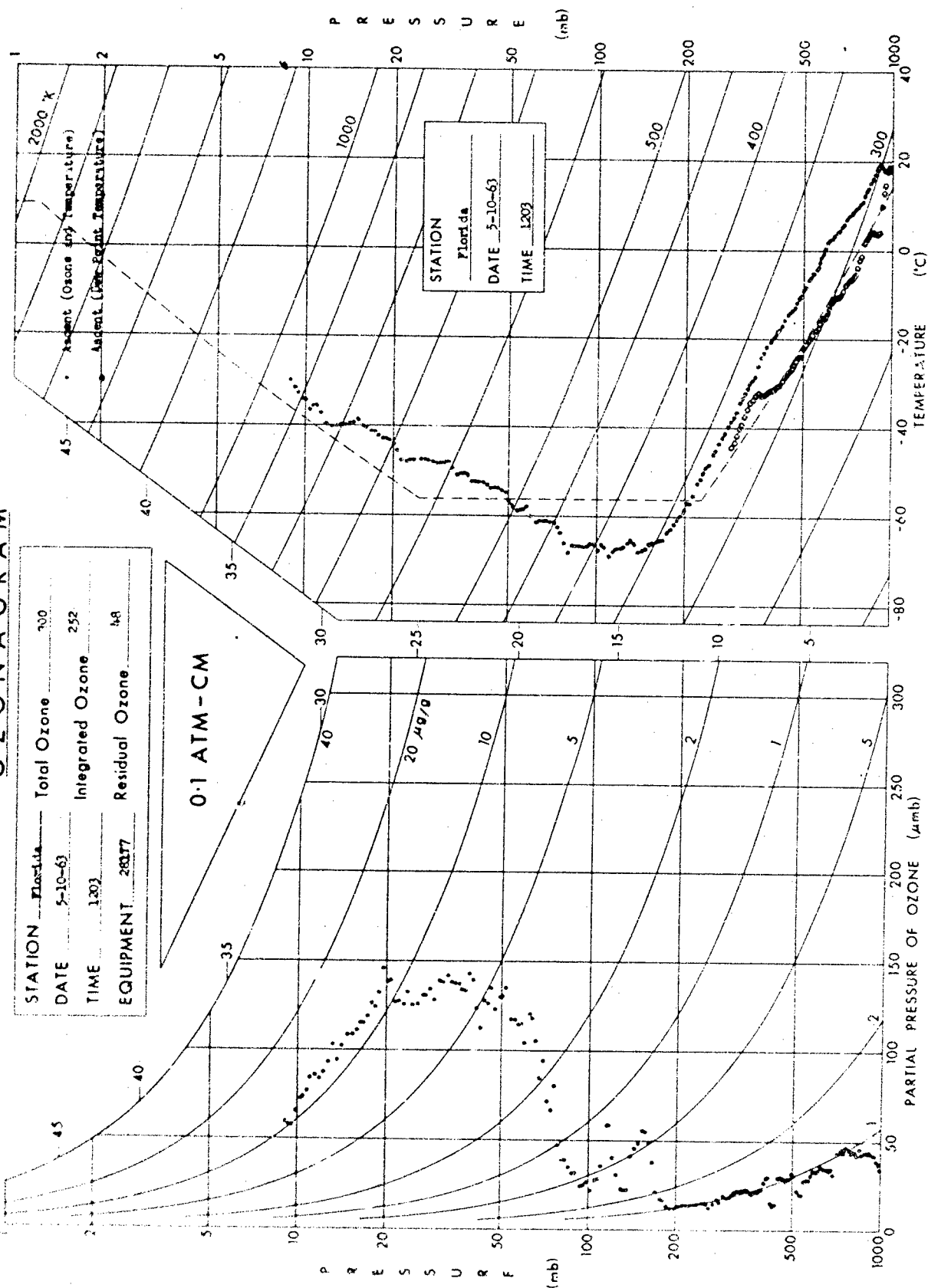
0.1 ATM-CM



## OZONAGRAM

STATION Florida Total Ozone 300  
 DATE 5-10-63 Integrated Ozone 252  
 TIME 1203 Residual Ozone 48  
 EQUIPMENT 28377

0.1 ATM-CM

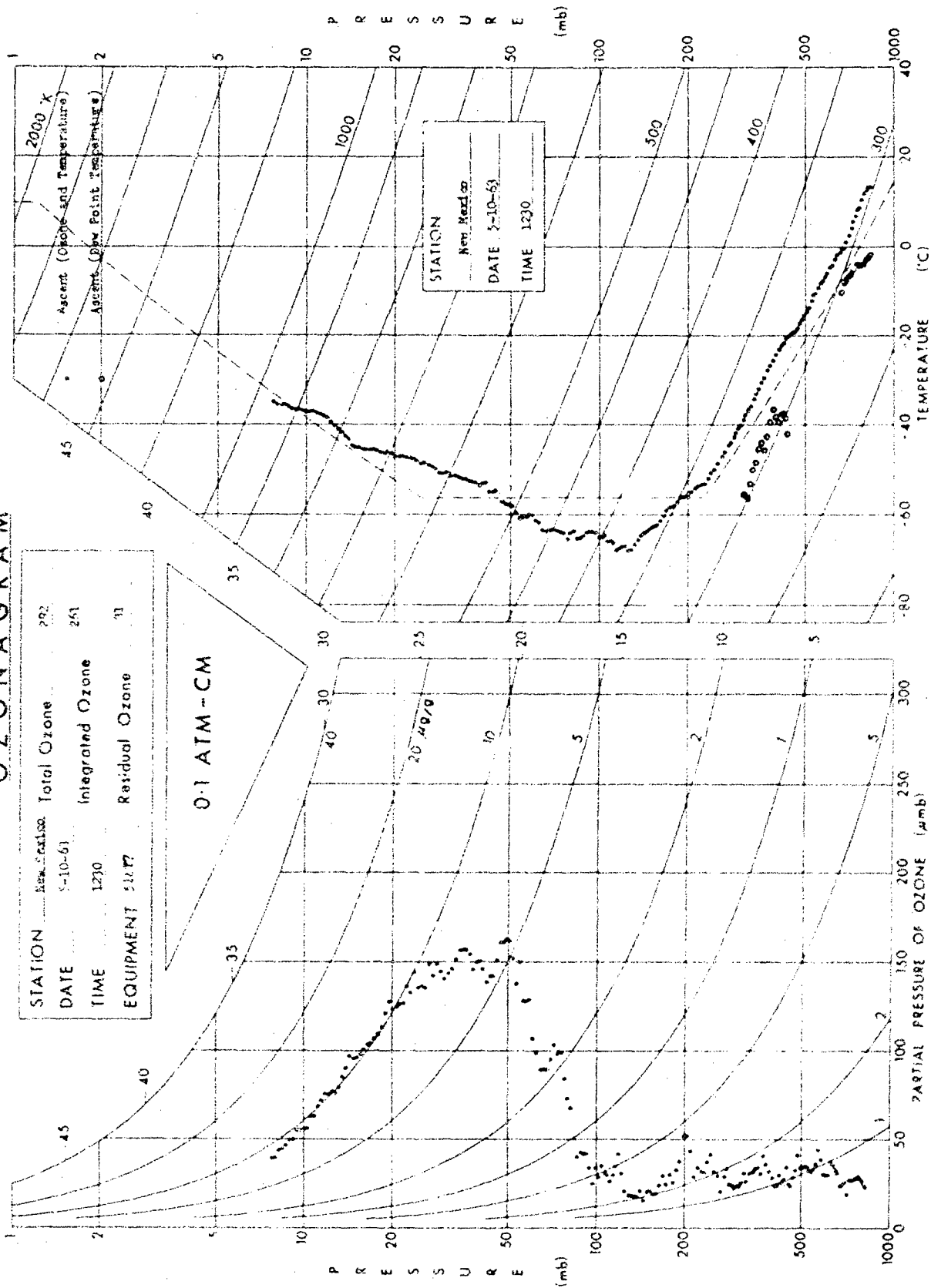


## OZONAGRAM

STATION New Mexico  
 DATE 5-10-61  
 TIME 1230  
 EQUIPMENT 5227

Total Ozone 202  
 Integrated Ozone 261  
 Residual Ozone 11

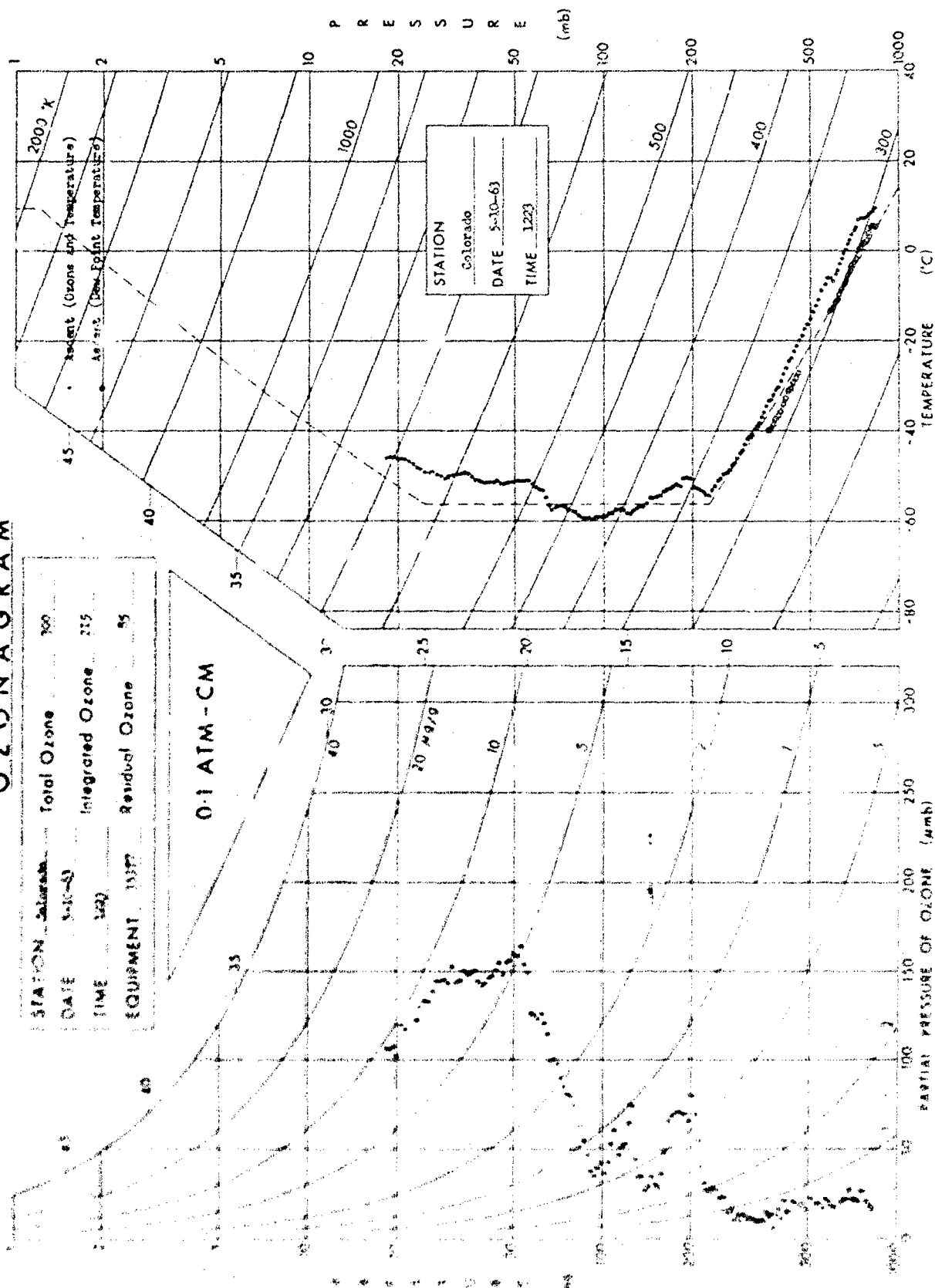
0.1 ATM-CM



## OZONAGRAM

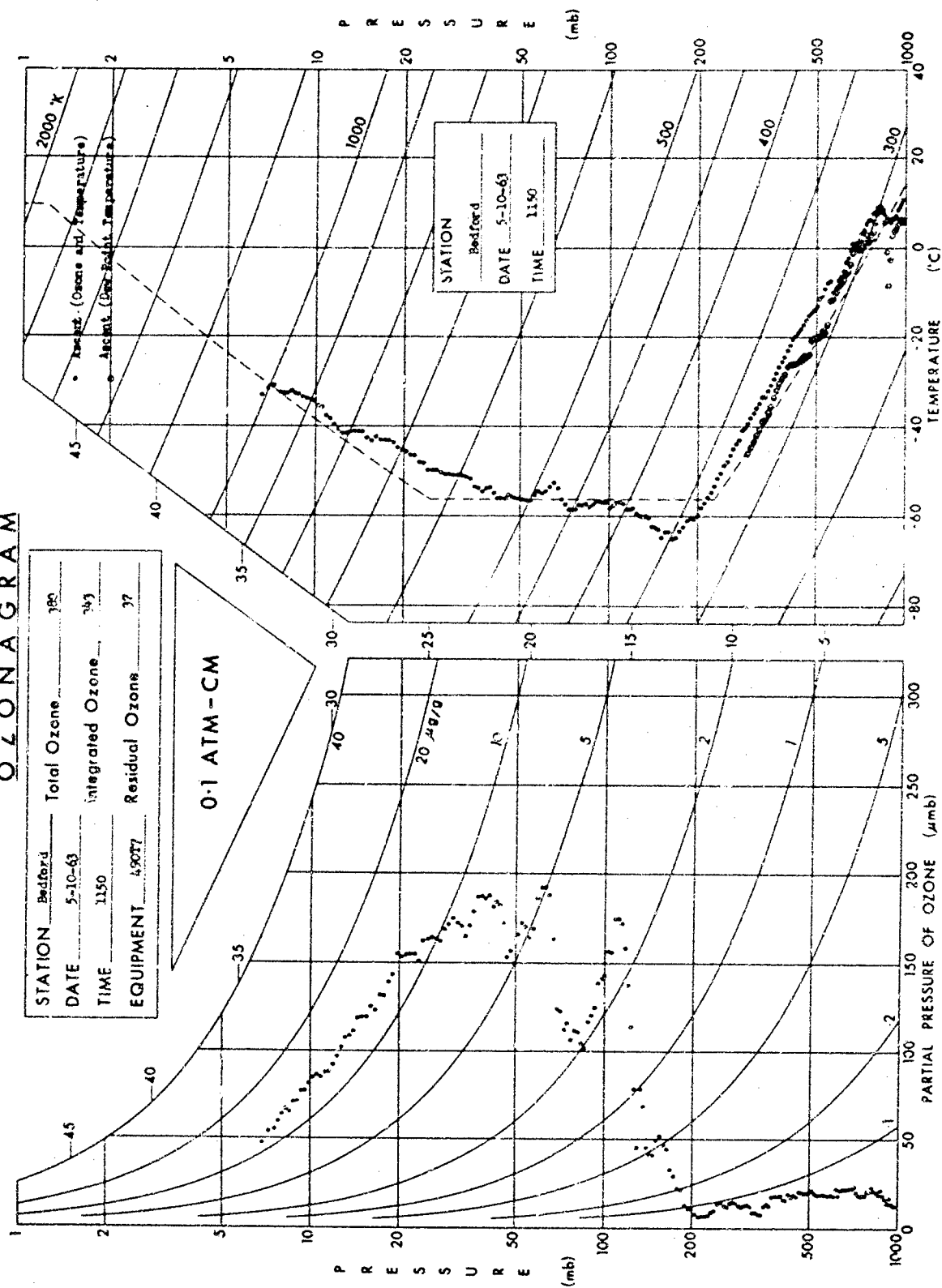
STATION Colorado Total Ozone 300  
 DATE 5-10-63 Integrated Ozone 215  
 TIME 1223 Residual Ozone 85  
 EQUIPMENT 1517

0.1 ATM-CM

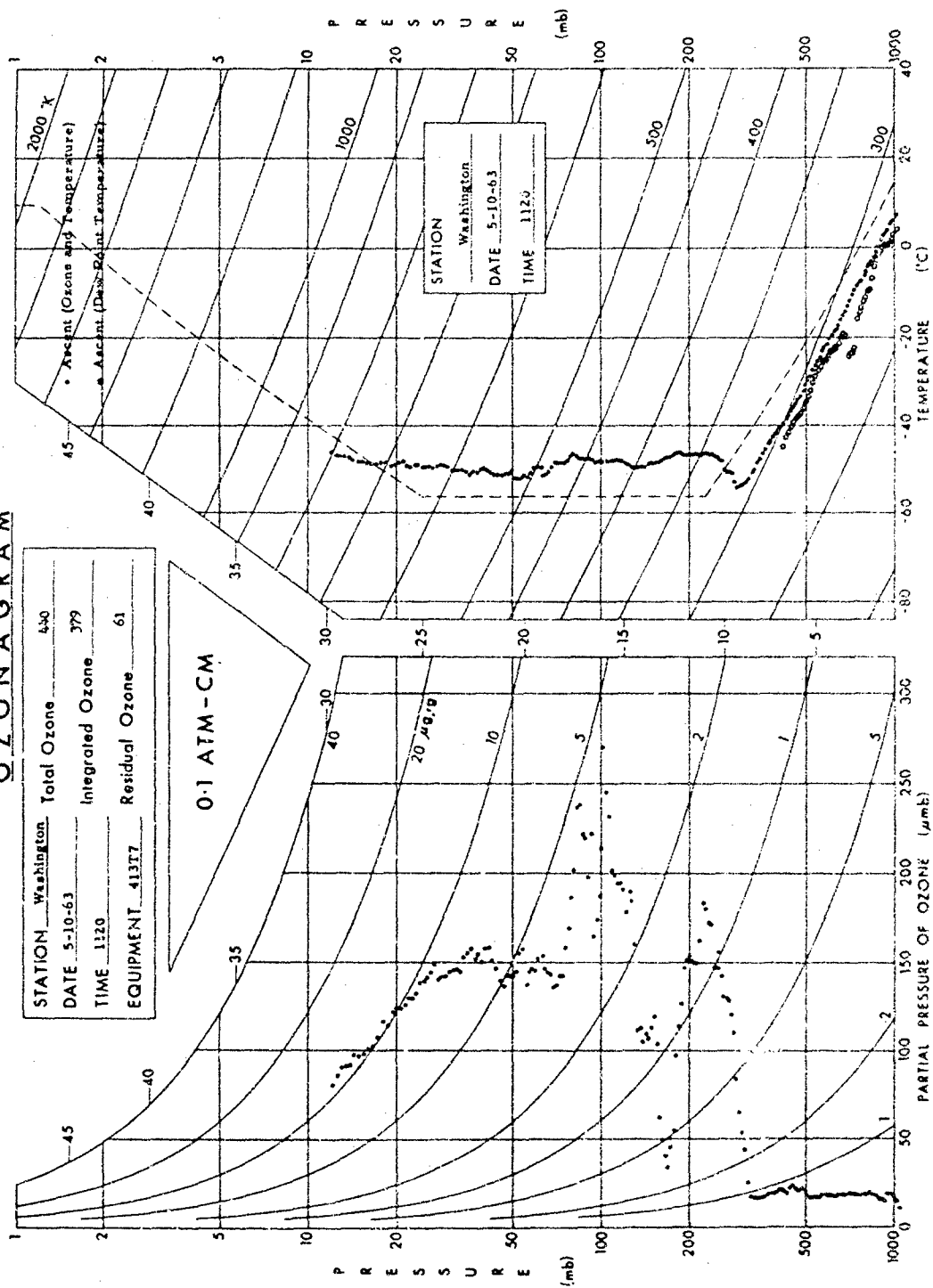




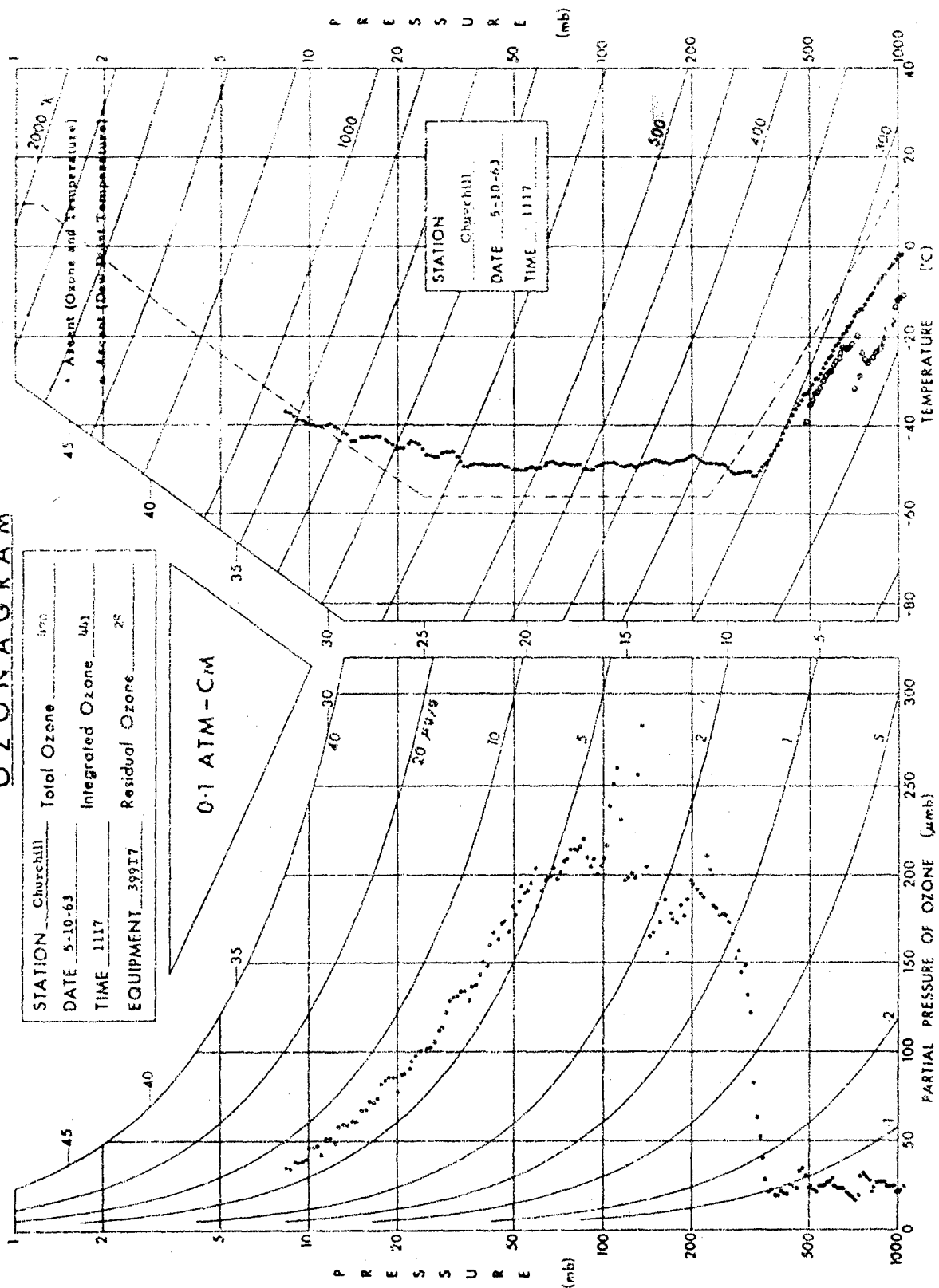
## O Z O N A G R A M



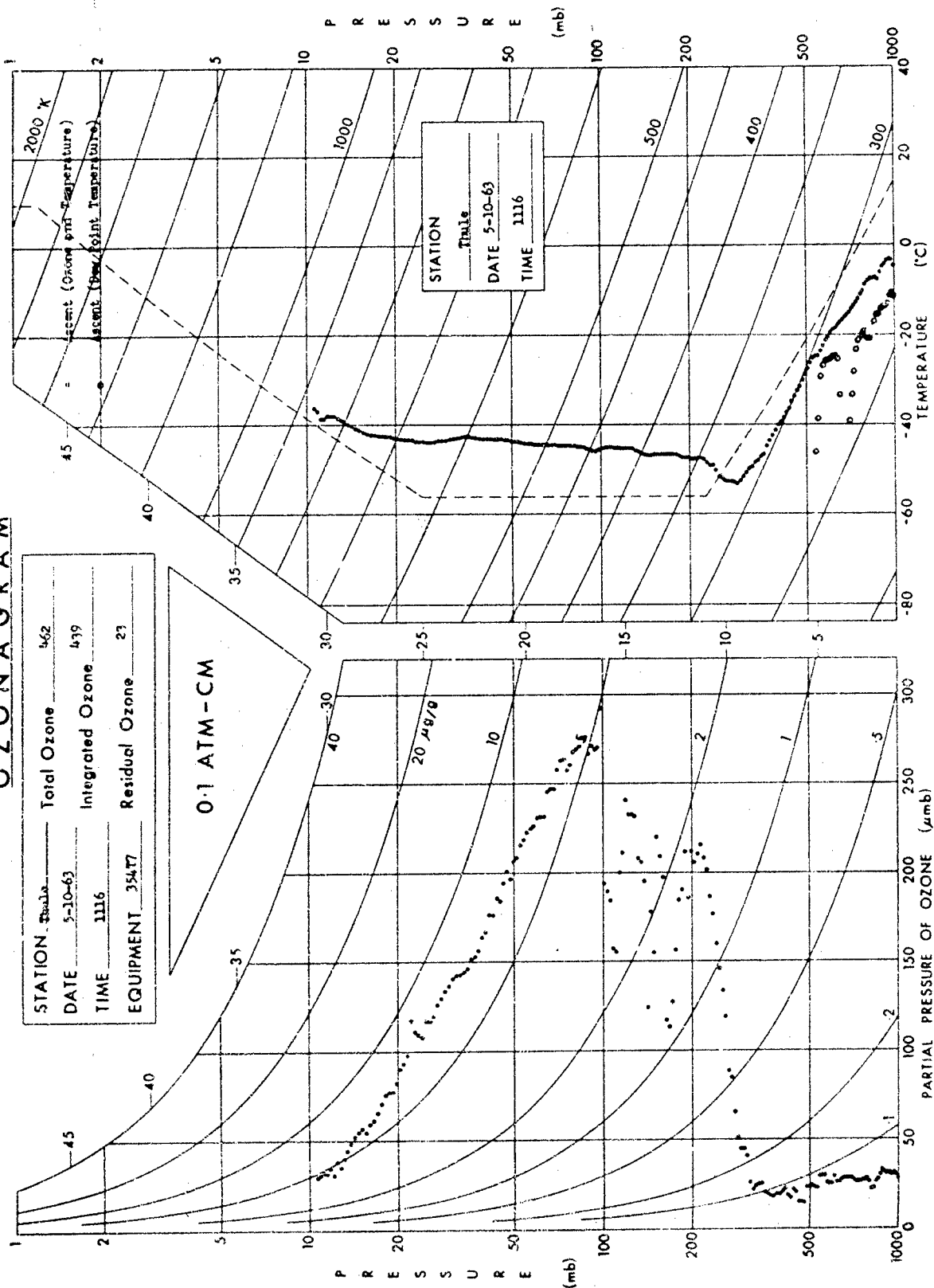
## O Z O N A G R A M



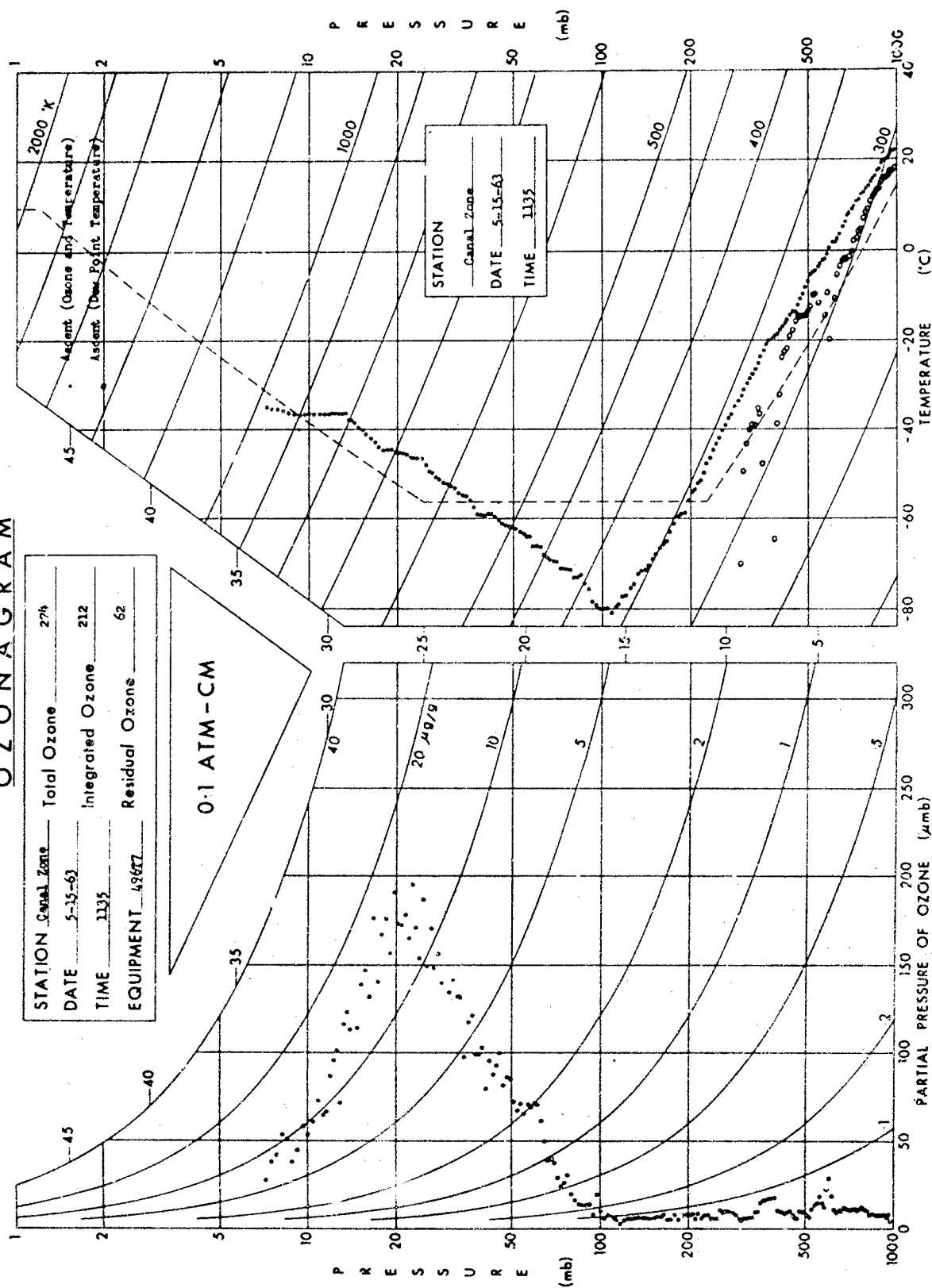
## OZONAGRAM



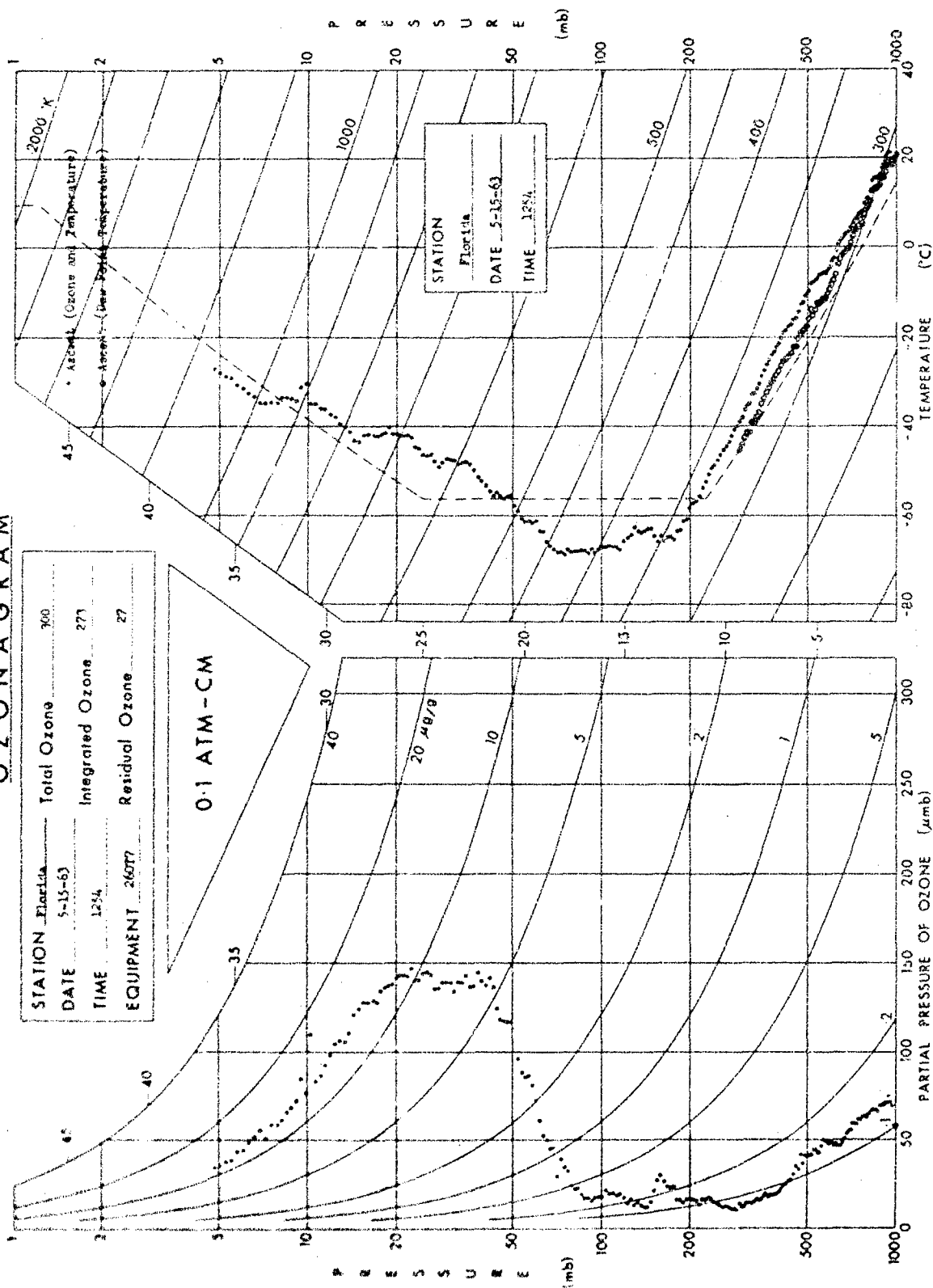
## O Z O N A G R A M



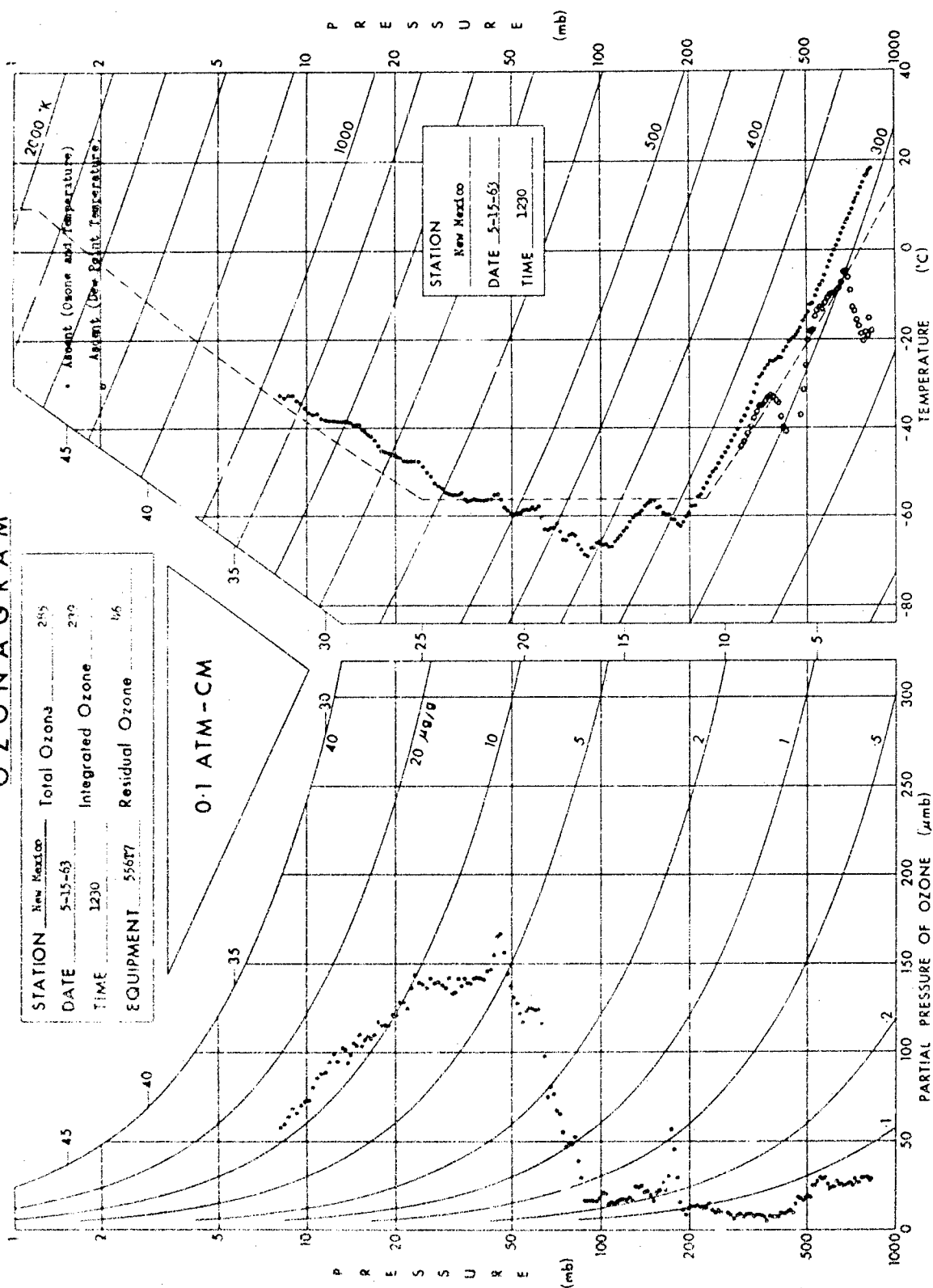
## OZONAGRAM



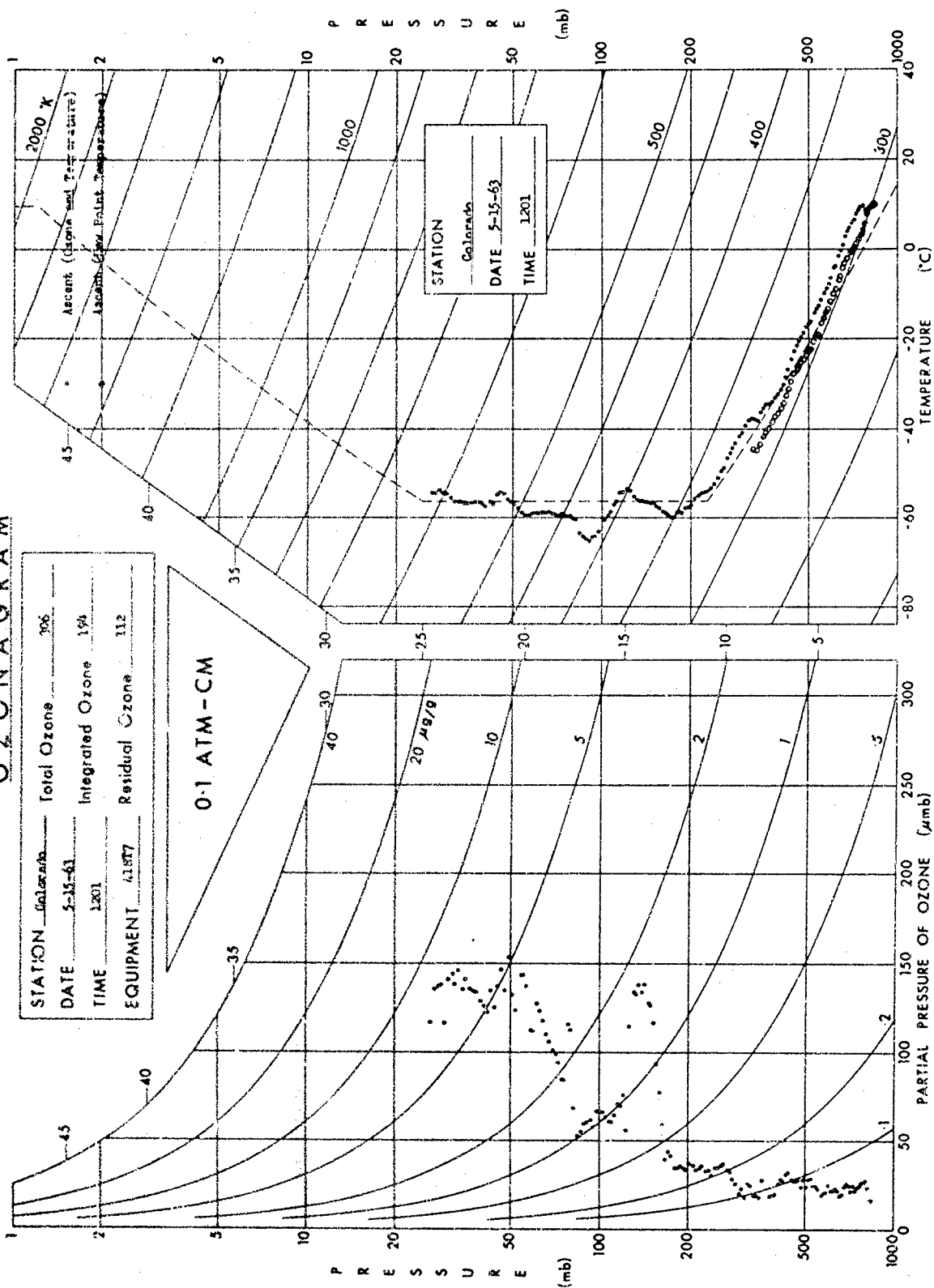
## OZONAGRAM



## OZONAGRAM

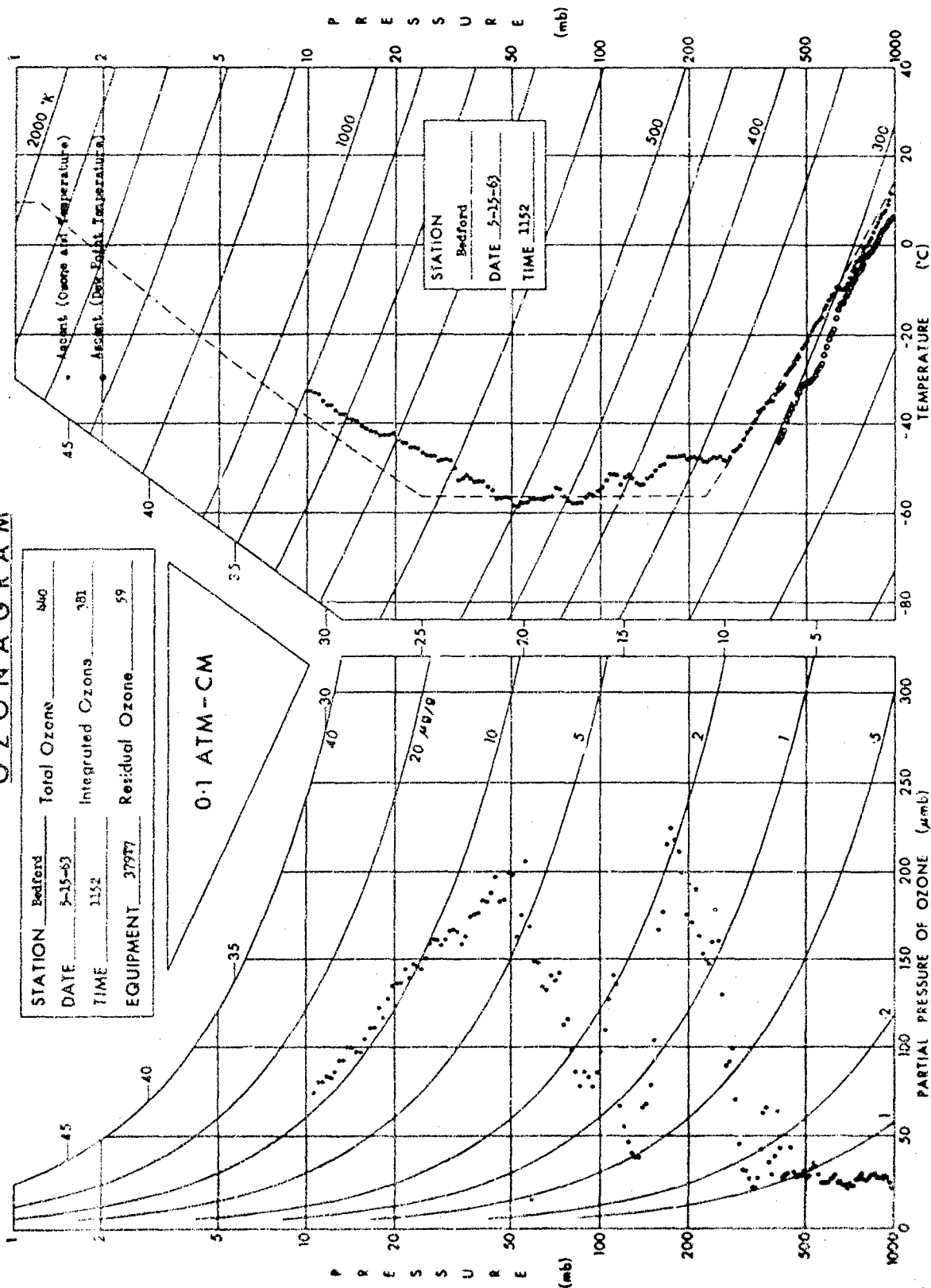


## OZONAGRAM





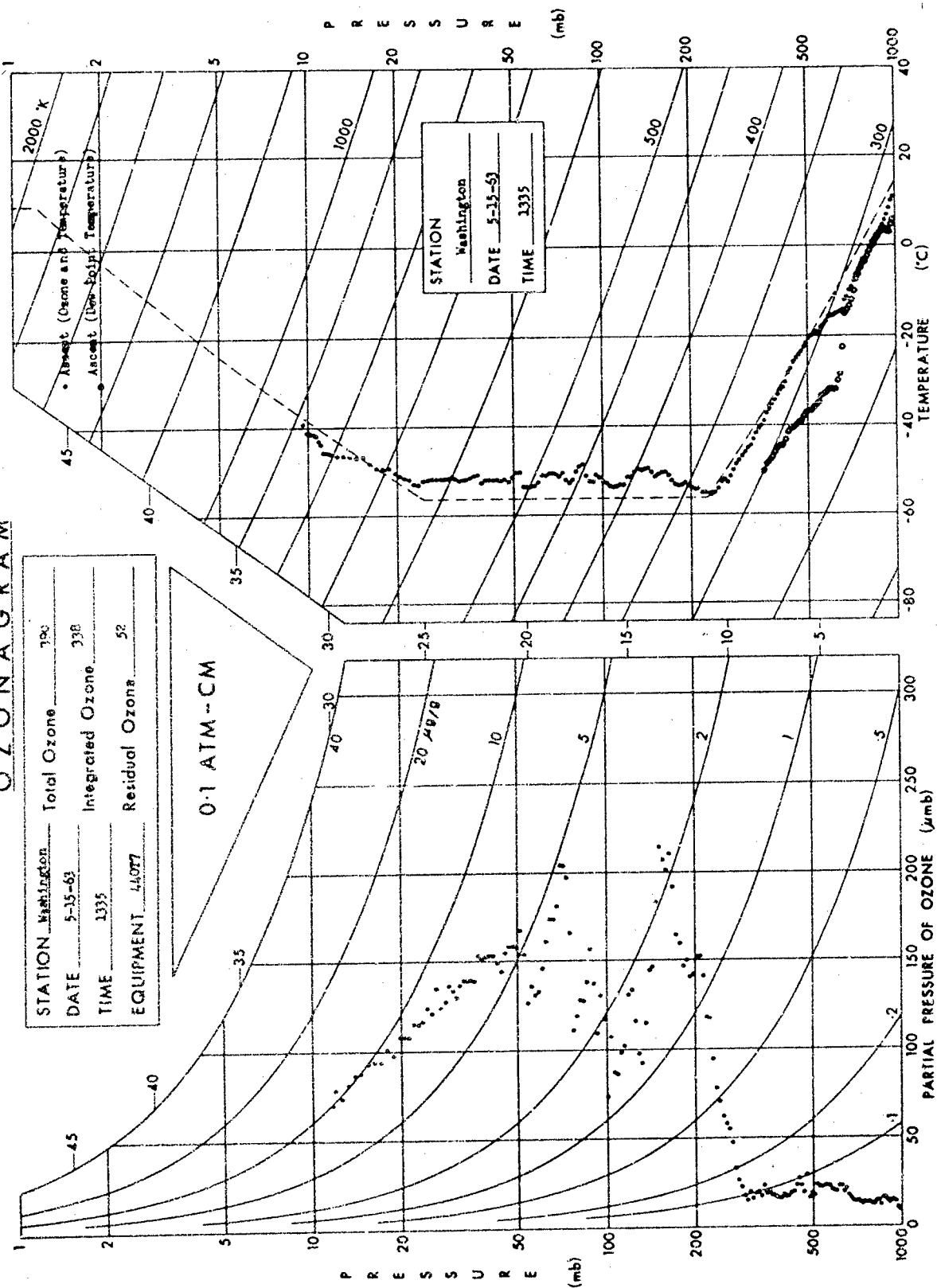
## O Z O N A G R A M



## OZONAGRAM

STATION Washington Total Ozone 790  
 DATE 5-15-63 Integrated Ozone 338  
 TIME 1335 Residual Ozone 52  
 EQUIPMENT LIOTT

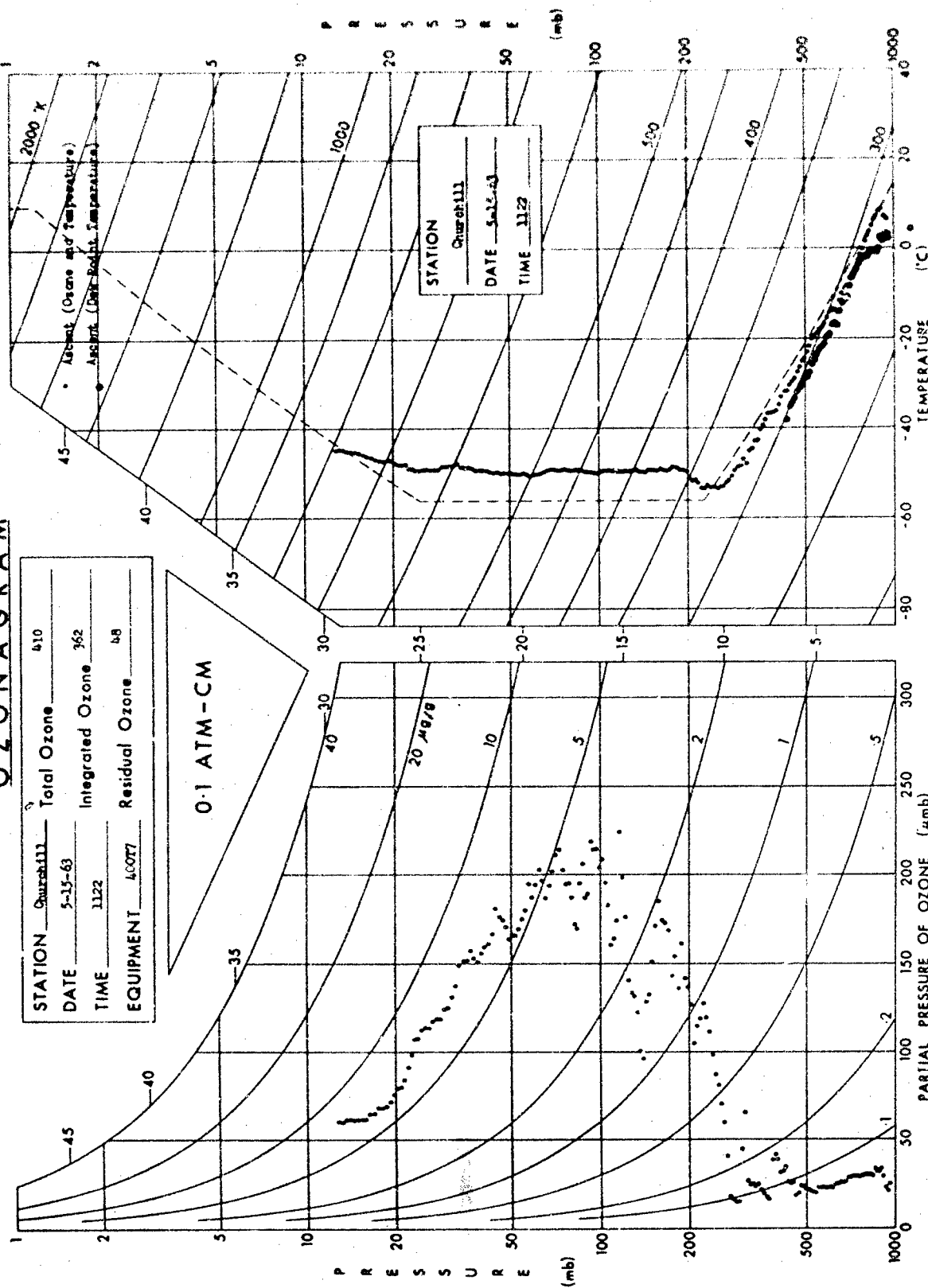
0.1 ATM-CM



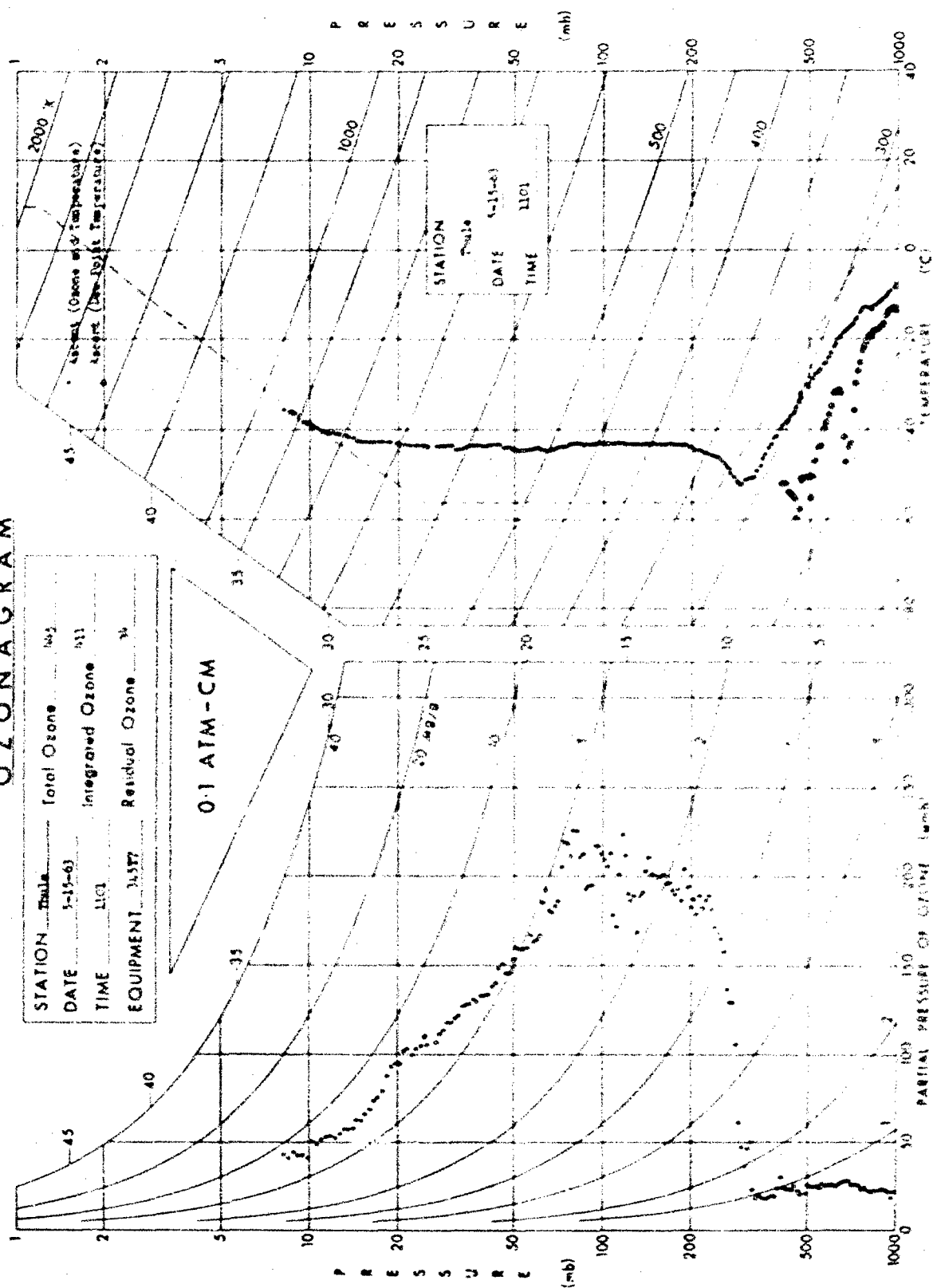
# OZONAGRAM

STATION	Queret411	Total Ozone	410
DATE	5-15-63	Integrated Ozone	362
TIME	1122	Residual Ozone	48
EQUIPMENT	40077		

0.1 ATM-CM



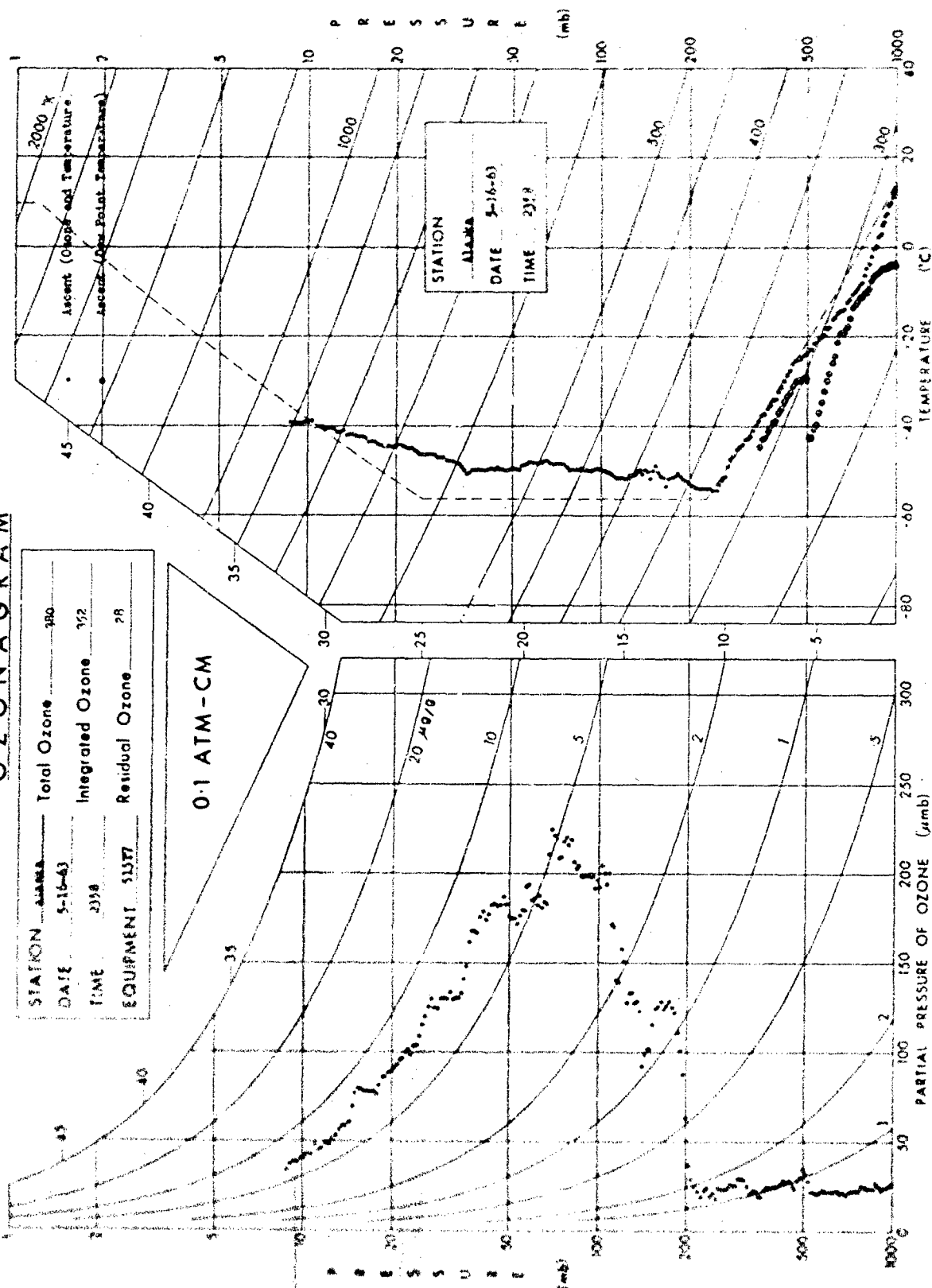
## OZONAGRAM



## O Z O N A G R A M

STATION	ALAMA	Total Ozone	380
DATE	5-16-63	Integrated Ozone	152
TIME	2358	Residual Ozone	28
EQUIPMENT	51377		

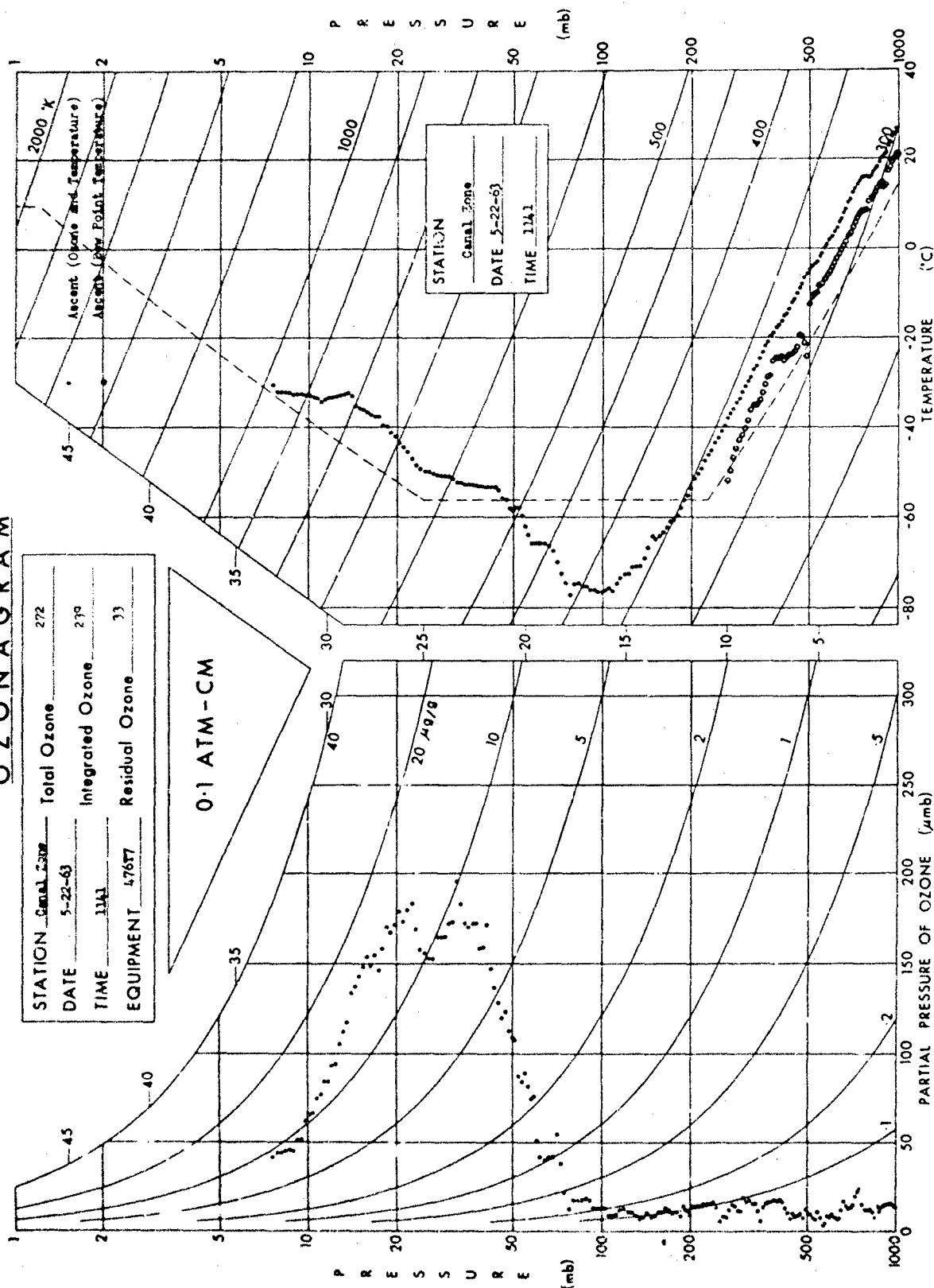
0.1 ATM-CM



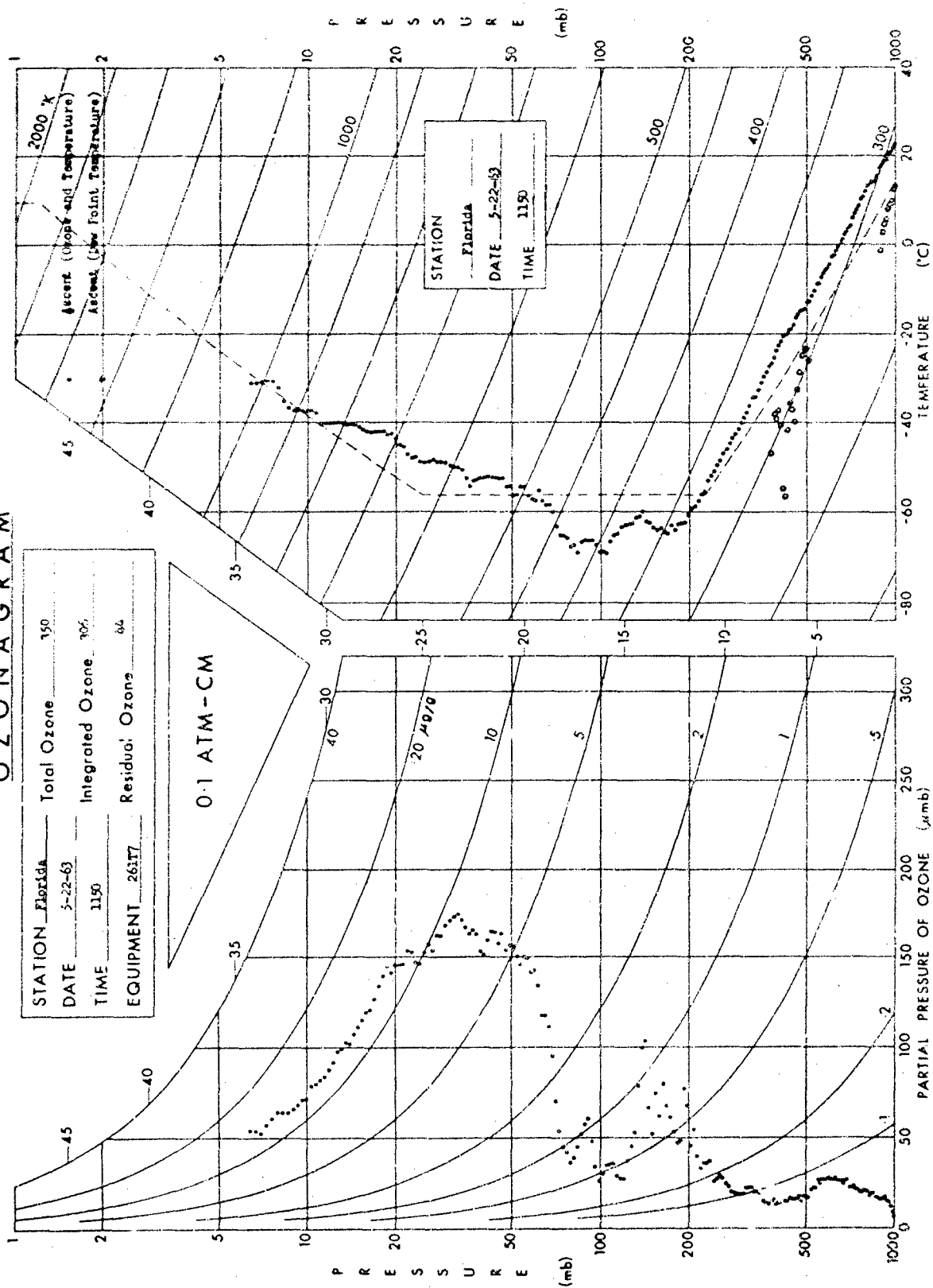
## OZONAGRAM

STATION	Canal Zone	Total Ozone	272
DATE	5-22-63	Integrated Ozone	270
TIME	1141	Residual Ozone	33
EQUIPMENT	47677		

0.1 ATM-CM



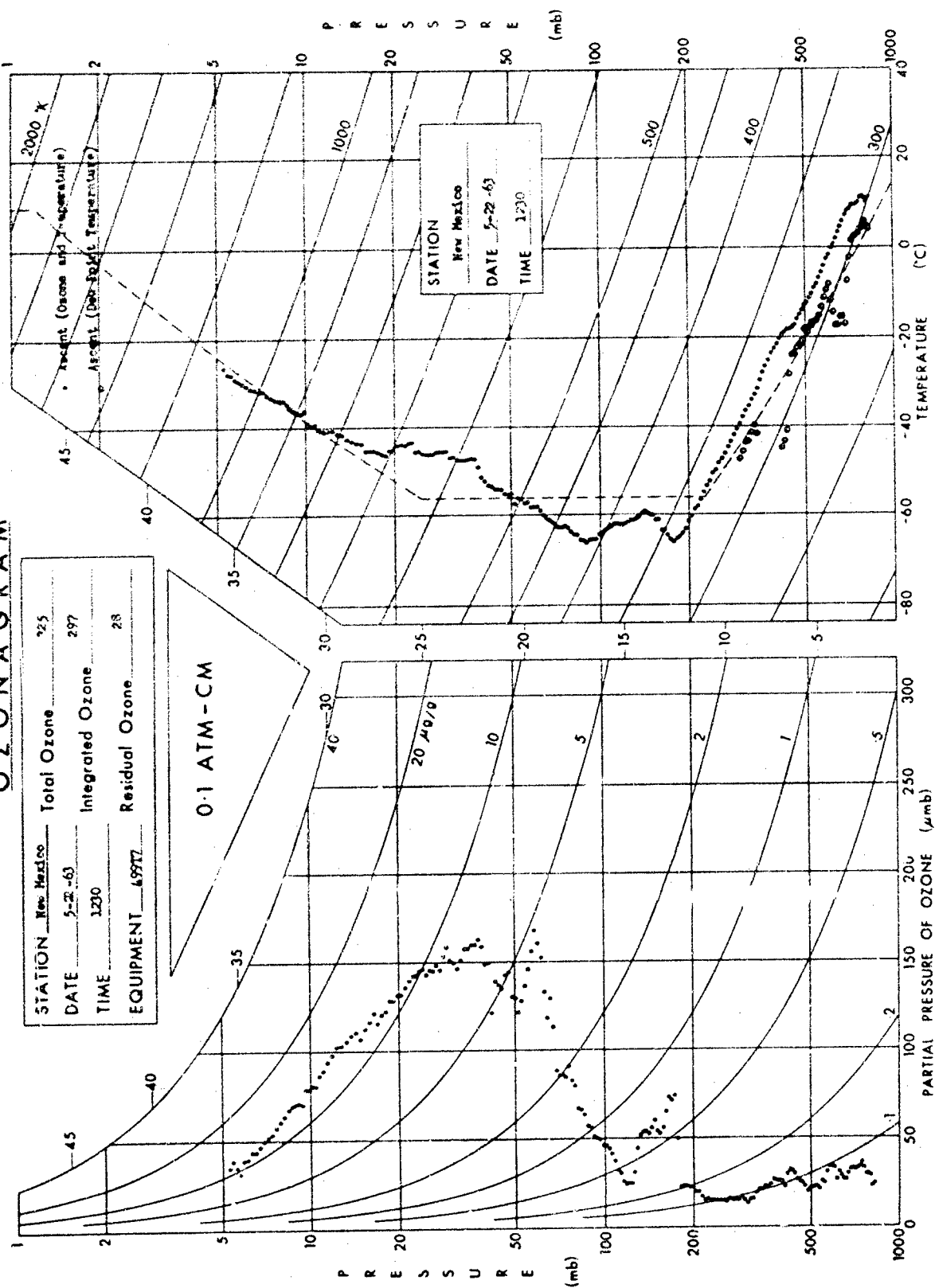
## O Z O N A G R A M



## O Z O N A G R A M

STATION <u>New Mexico</u>	Total Ozone <u>225</u>
DATE <u>5-22-63</u>	Integrated Ozone <u>297</u>
TIME <u>1230</u>	Residual Ozone <u>28</u>
EQUIPMENT <u>49977</u>	

0.1 ATM - CM

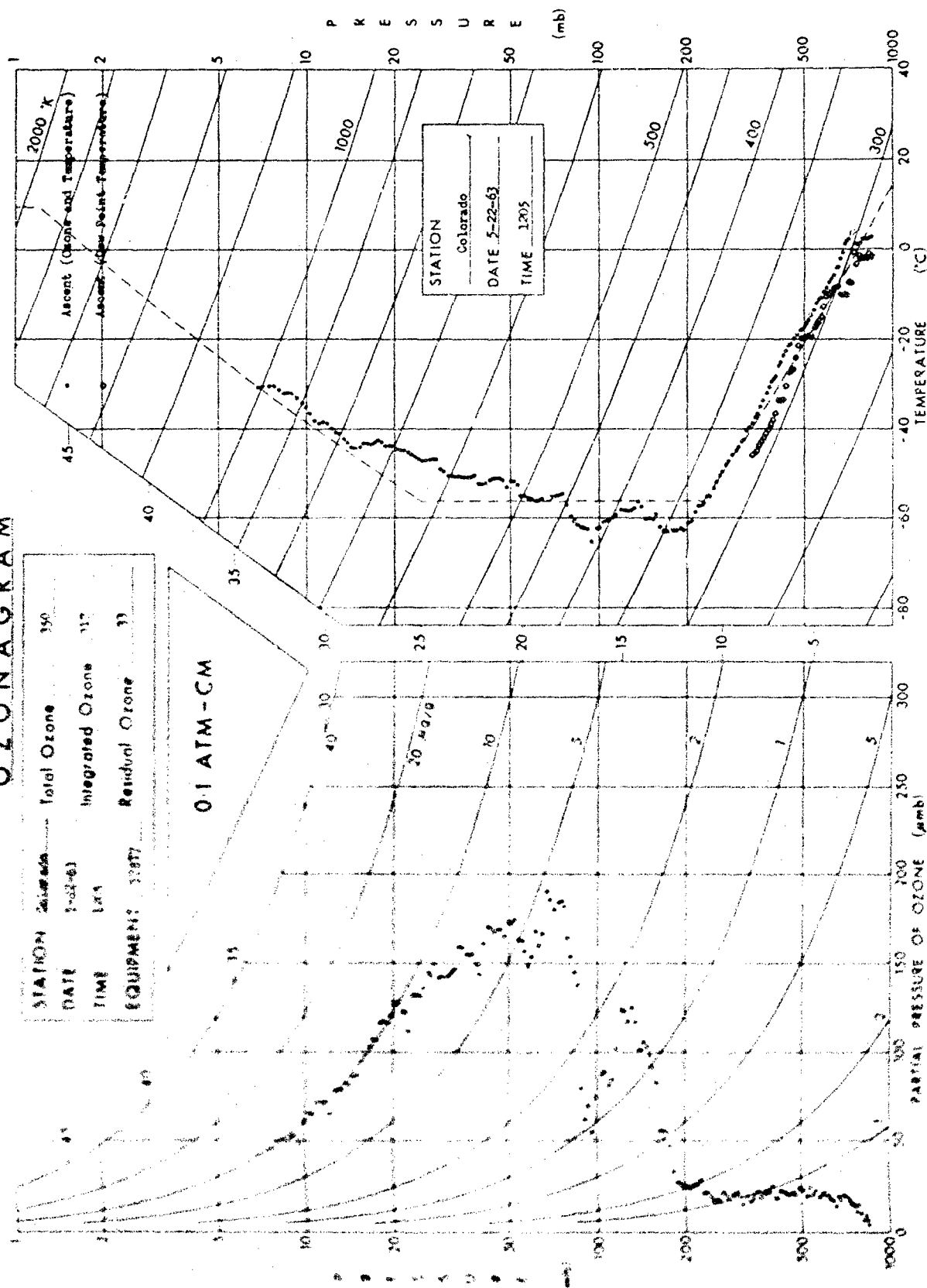




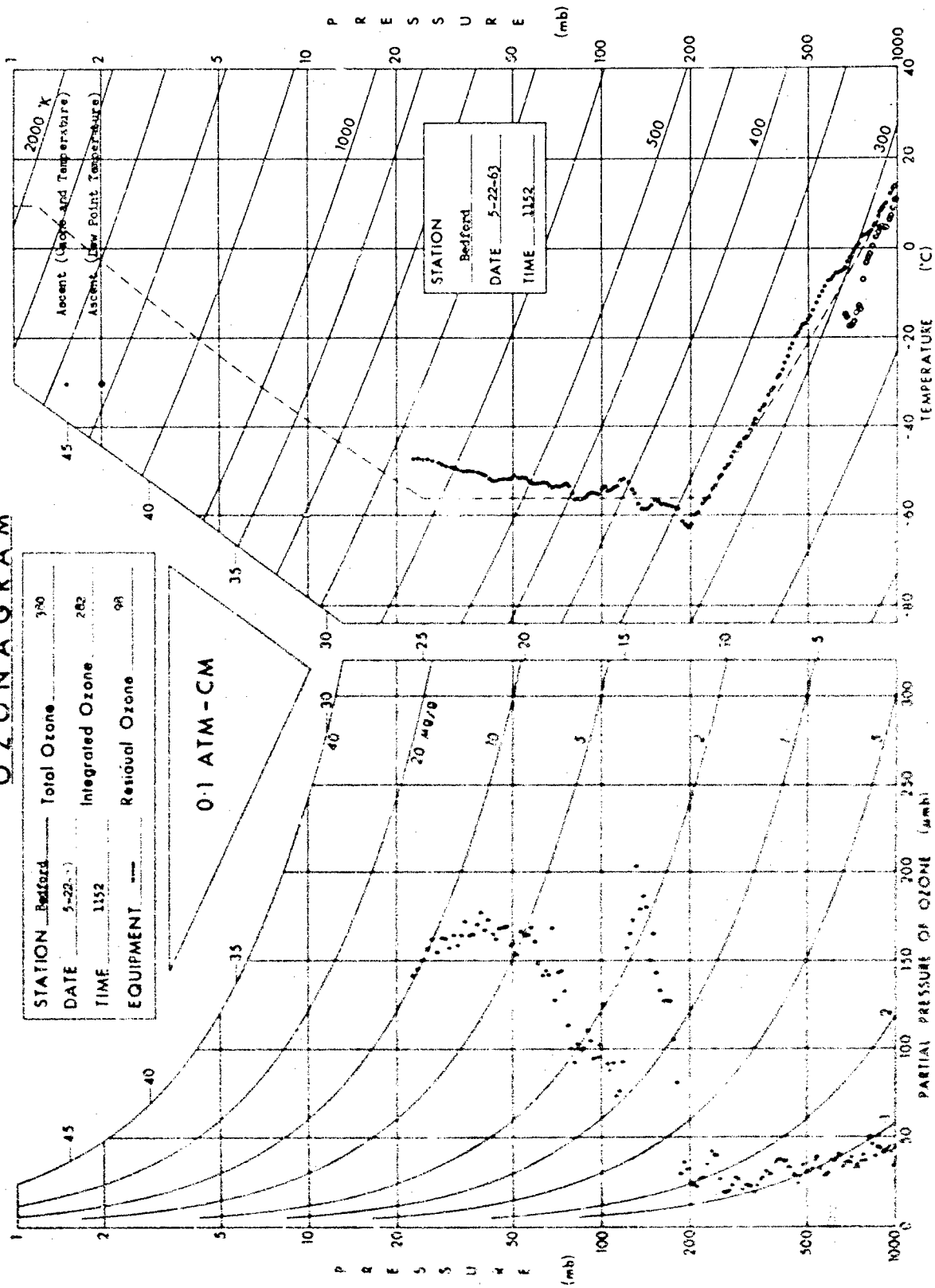
## OZONAGRAM

STATION *Colorado* Total Ozone 190  
 DATE 5-22-63 Integrated Ozone 117  
 TIME 1245 Residual Ozone 33  
 EQUIPMENT 3387

0.1 ATM-CM



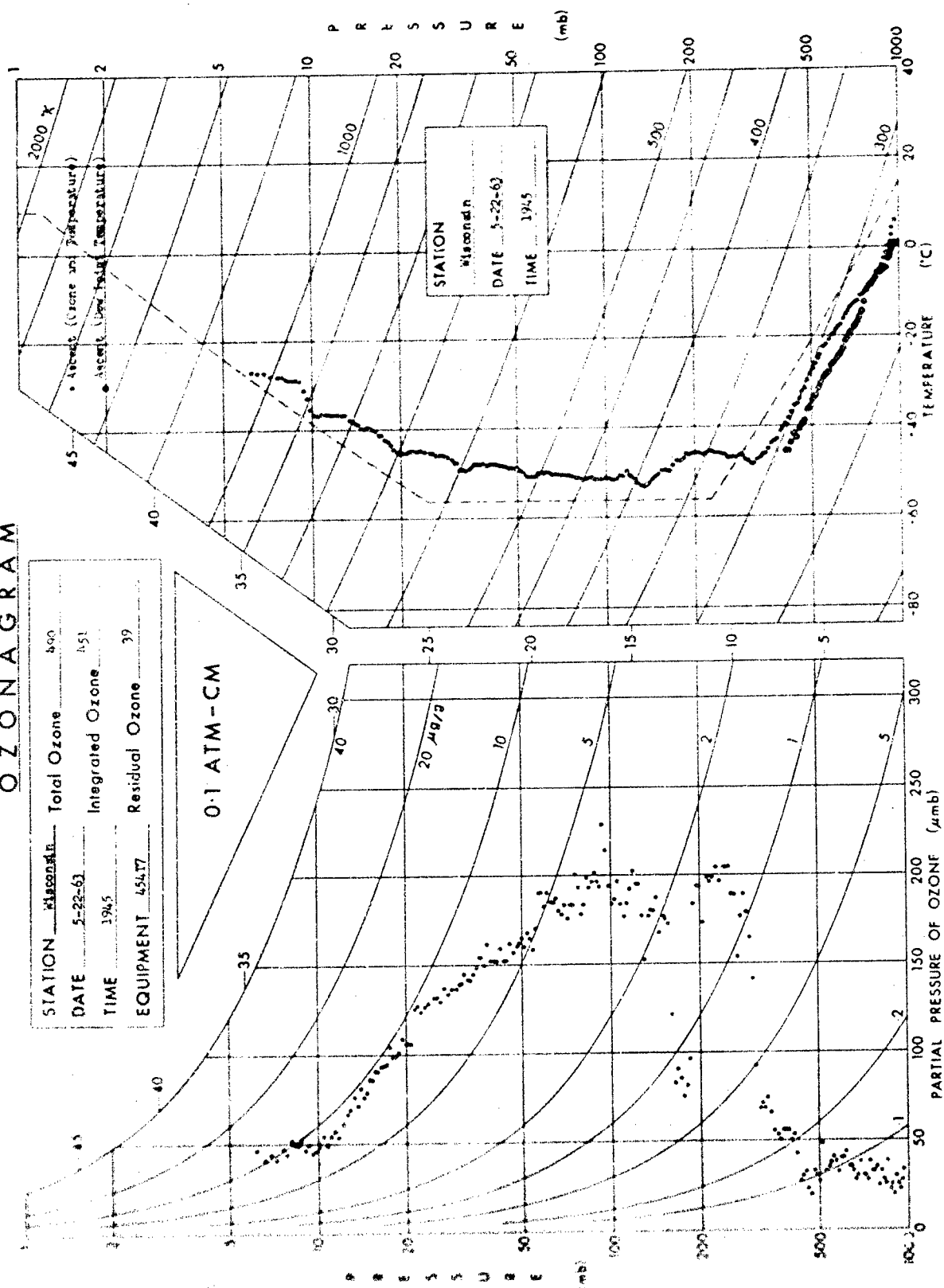
## OZONAGRAM



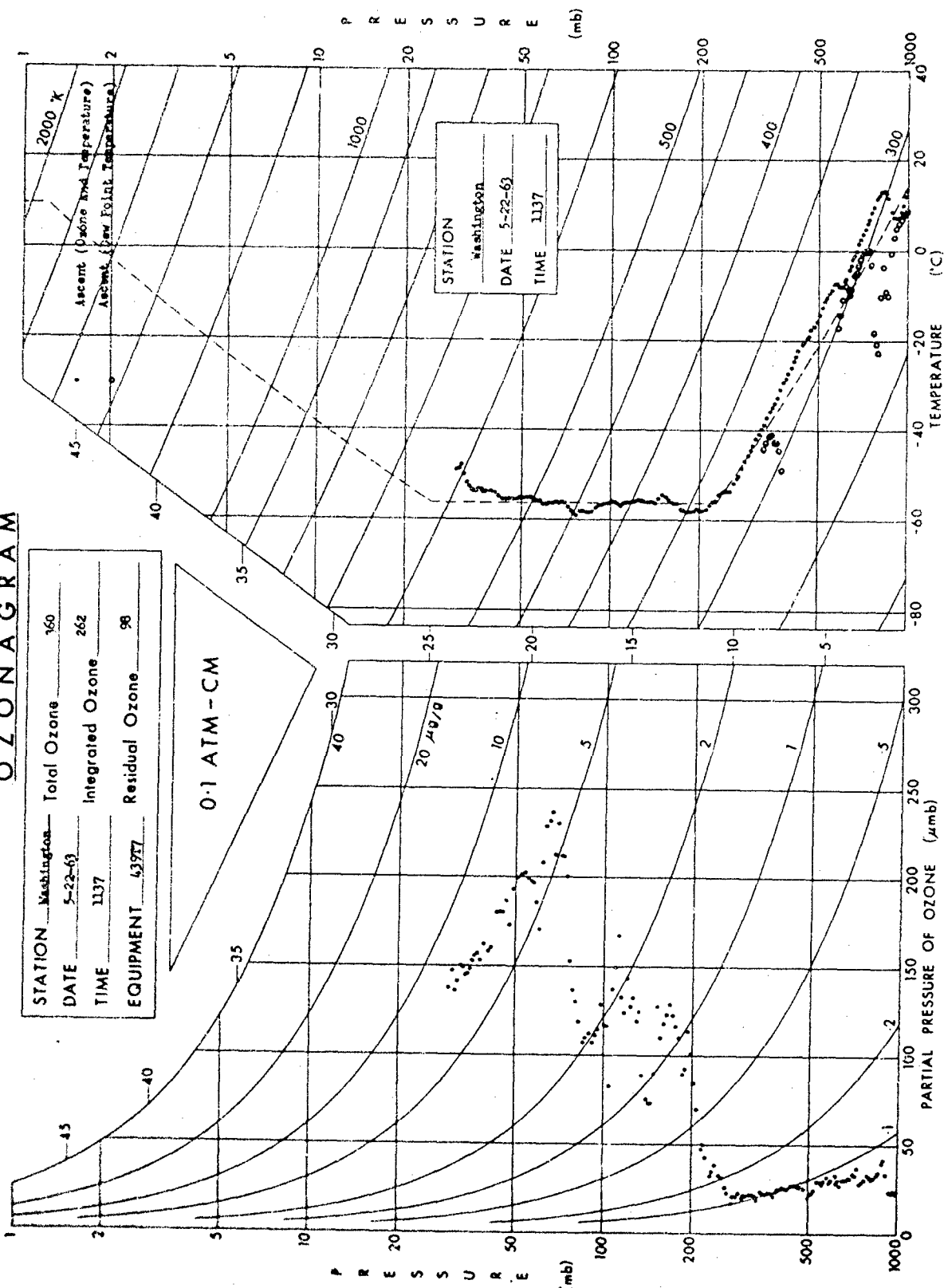
## OZONAGRAM

STATION Wisconsin Total Ozone 450  
 DATE 5-22-63 Integrated Ozone 151  
 TIME 1945 Residual Ozone 39  
 EQUIPMENT 45417

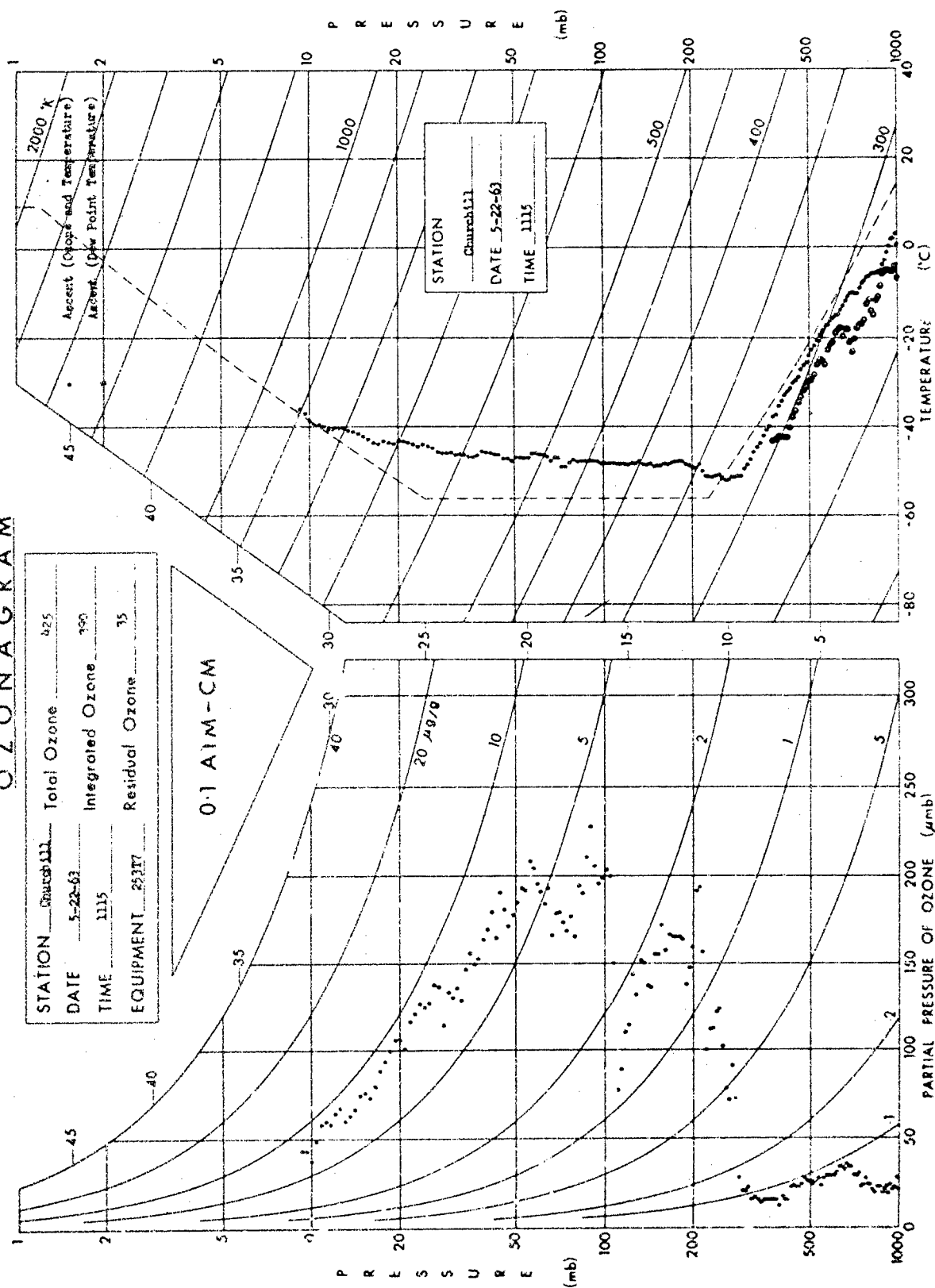
0.1 ATM-CM



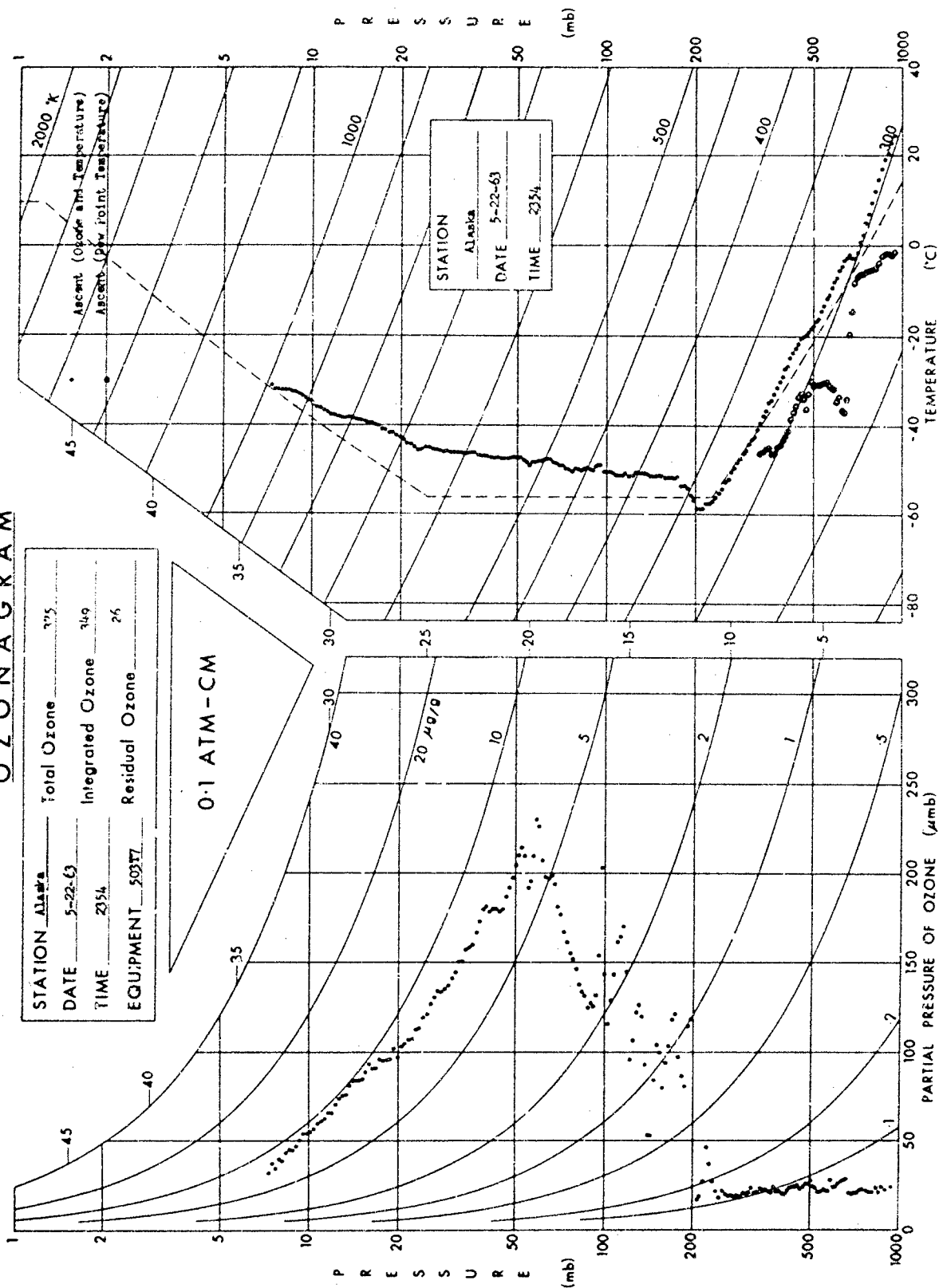
## OZONAGRAM



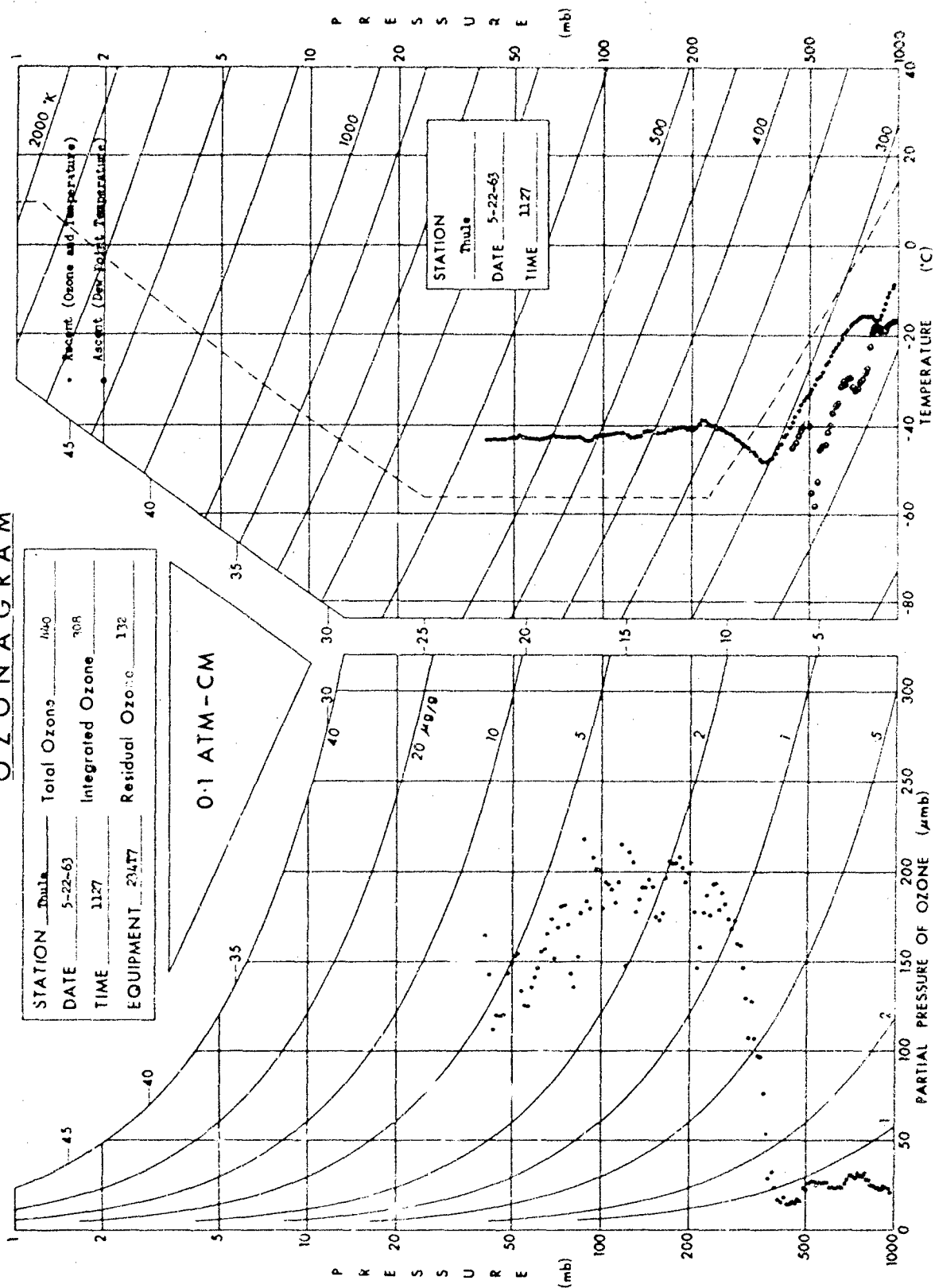
## O Z O N A G R A M



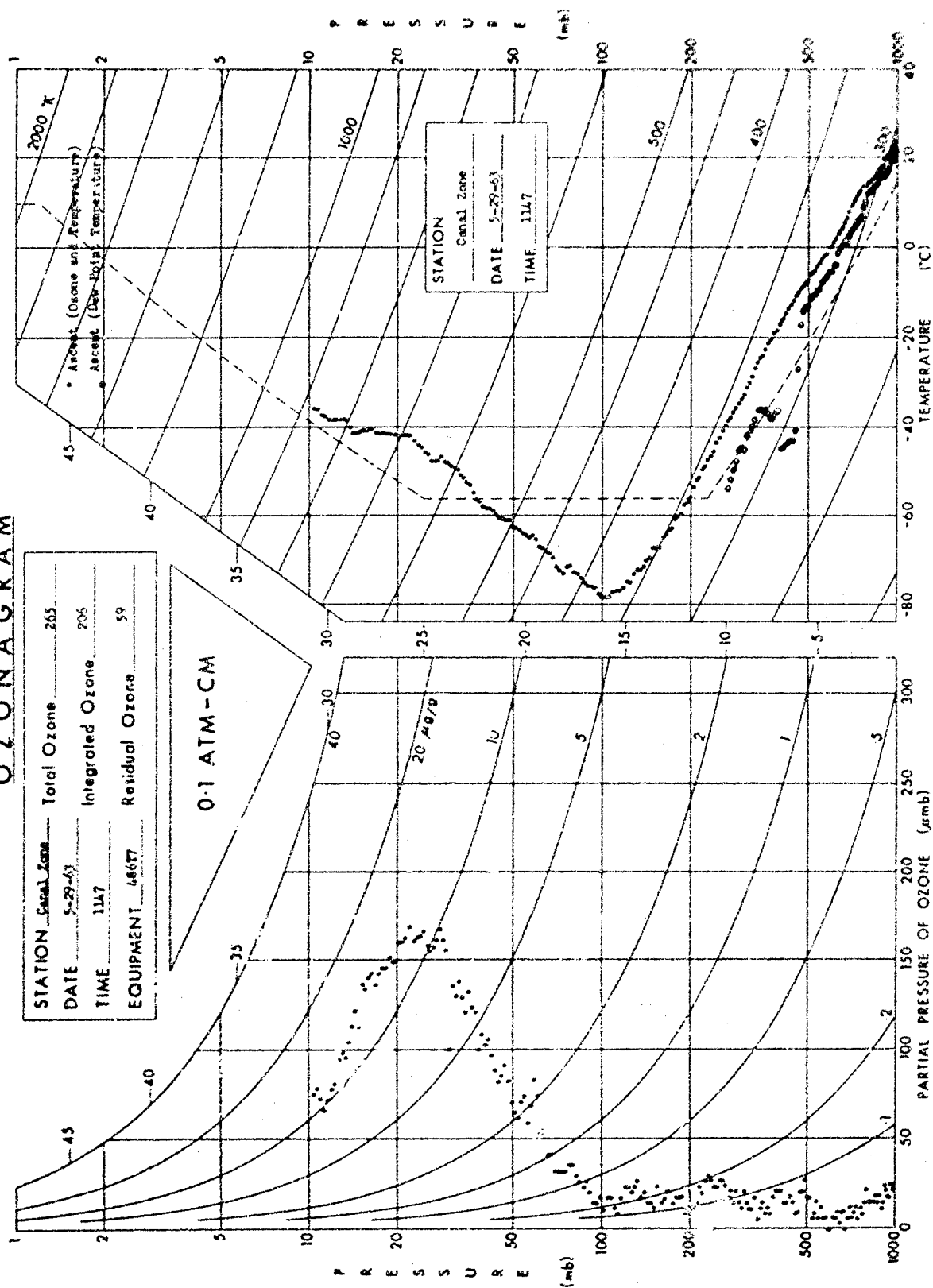
## O Z O N A G R A M



## OZONAGRAM



## OZONAGRAM

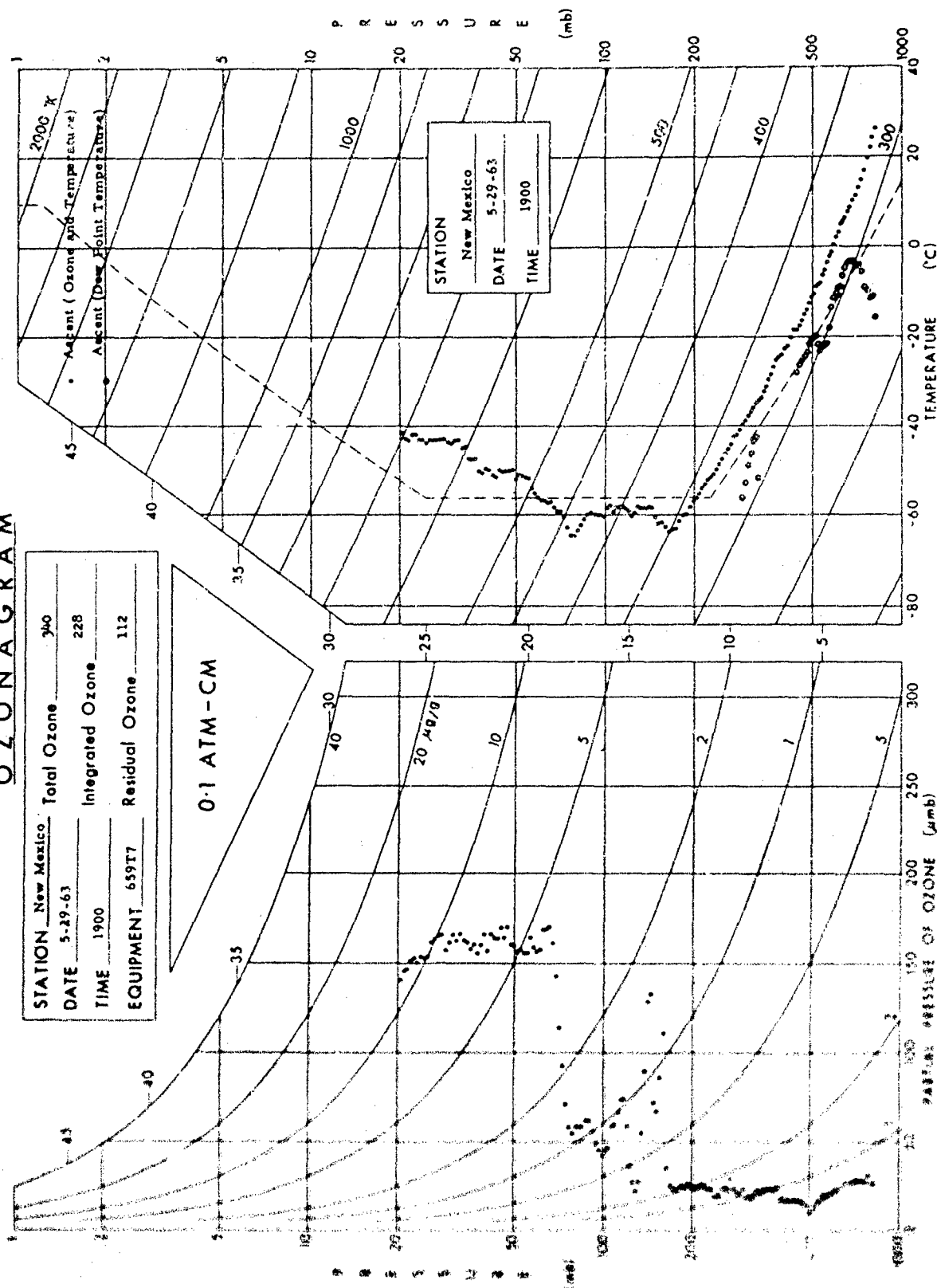




## OZONAGRAM

STATION	New Mexico	Total Ozone	340
DATE	5-29-63	Integrated Ozone	228
TIME	1900		
EQUIPMENT	659T7	Residual Ozone	112

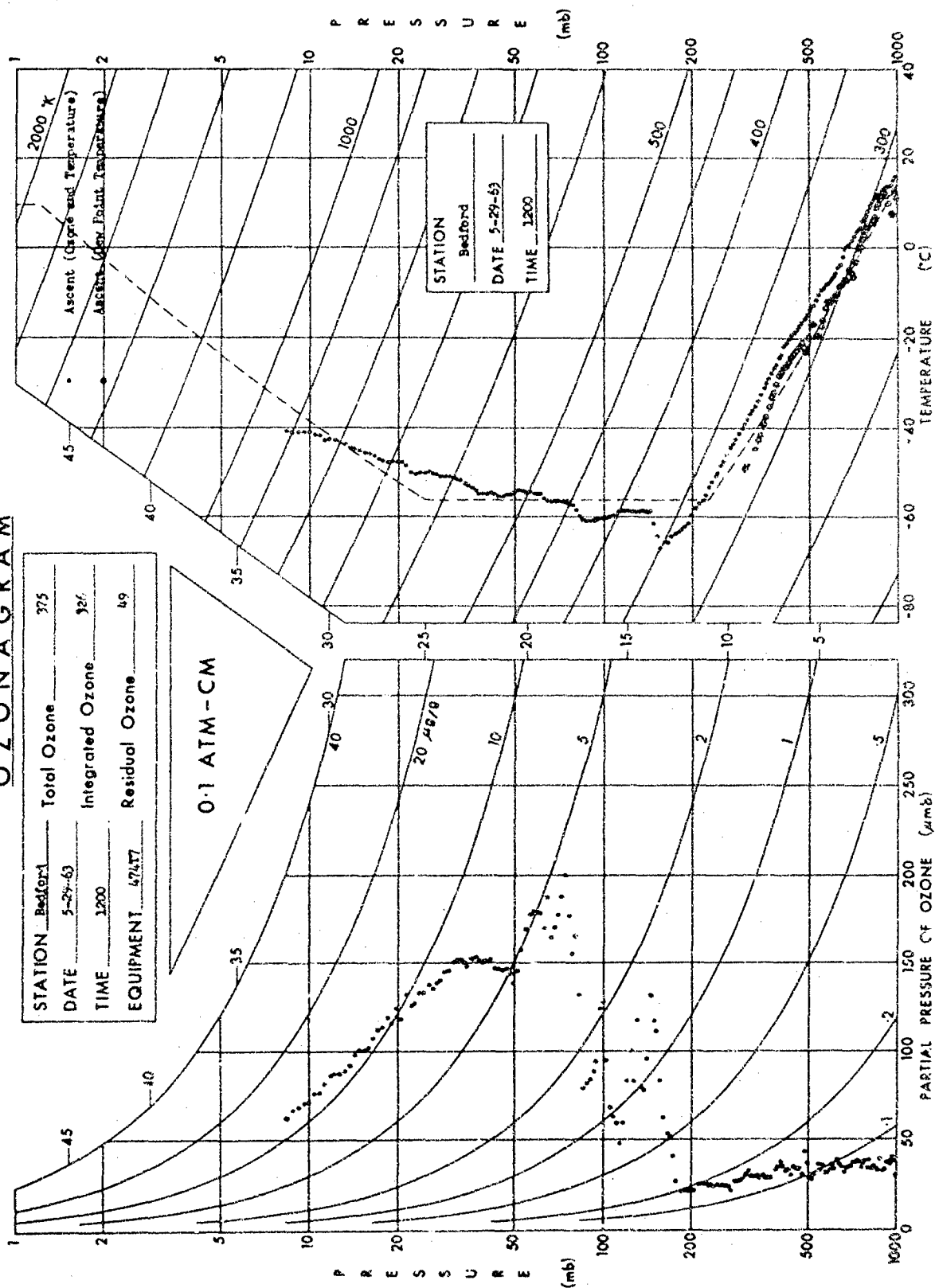
0.1 ATM-CM



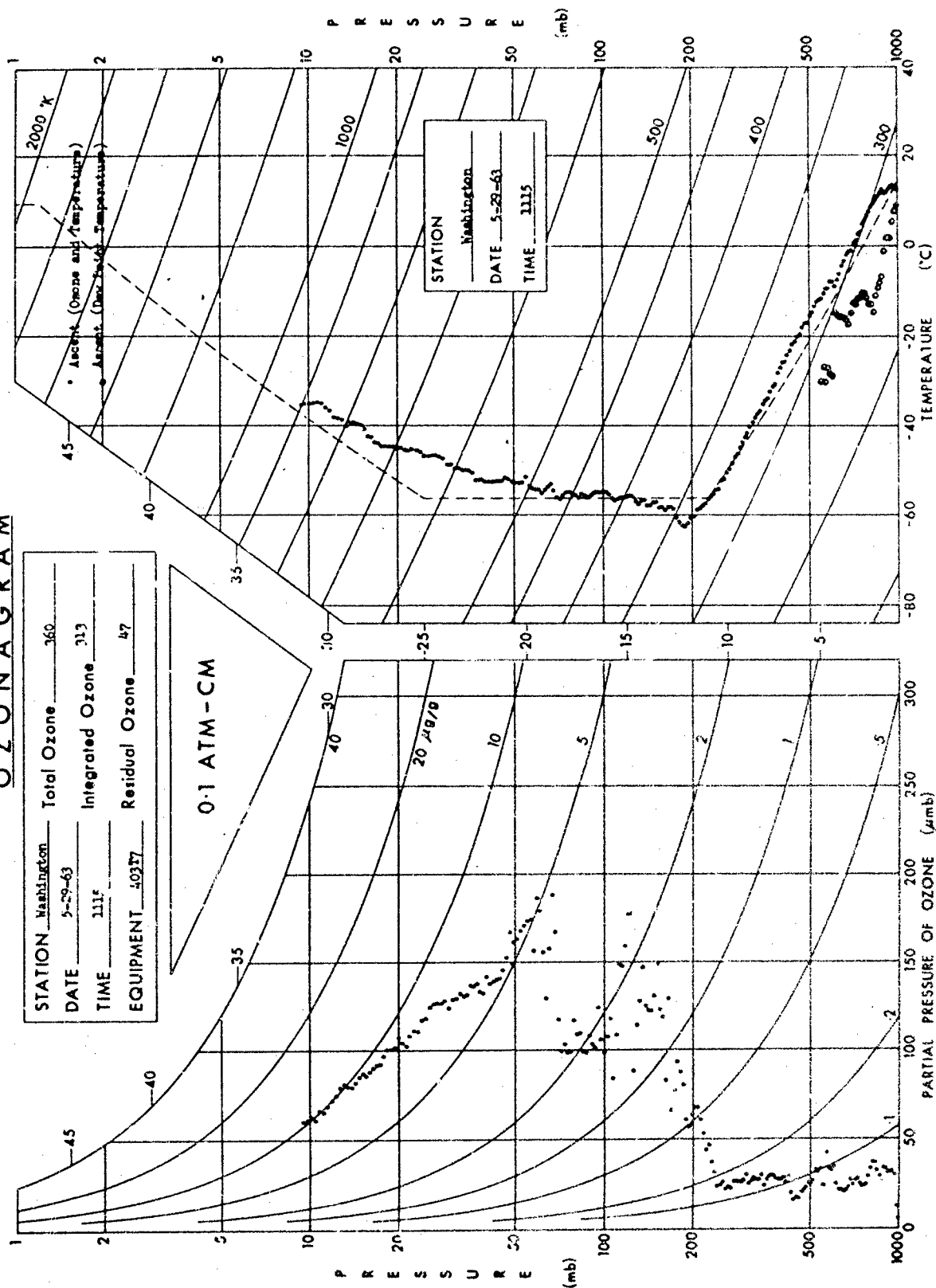
## O Z O N A G R A M

STATION	Bedford	Total Ozone	375
DATE	5-29-63	Integrated Ozone	326
TIME	1200	Residual Ozone	49
EQUIPMENT	47417		

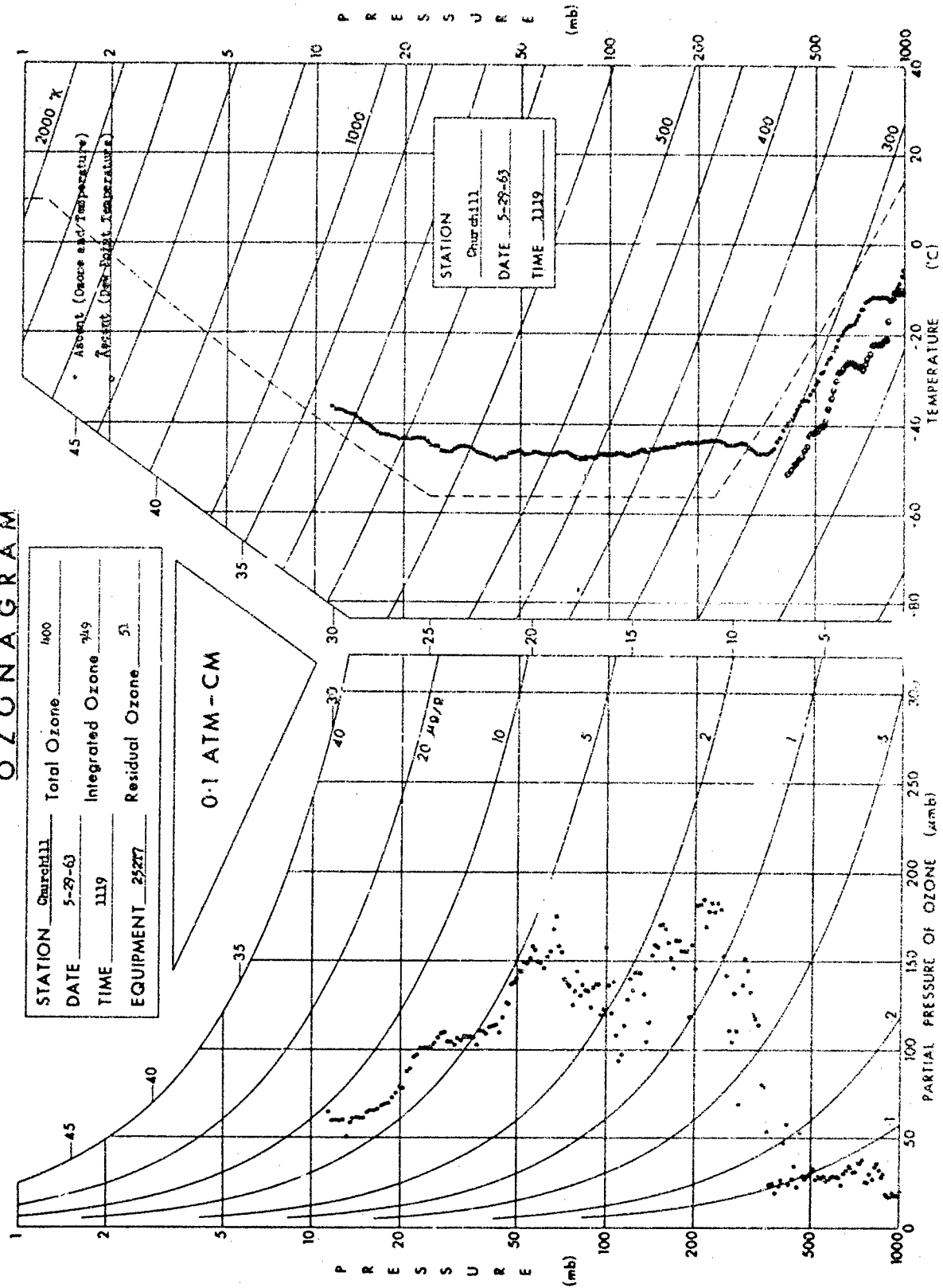
0.1 ATM-CM



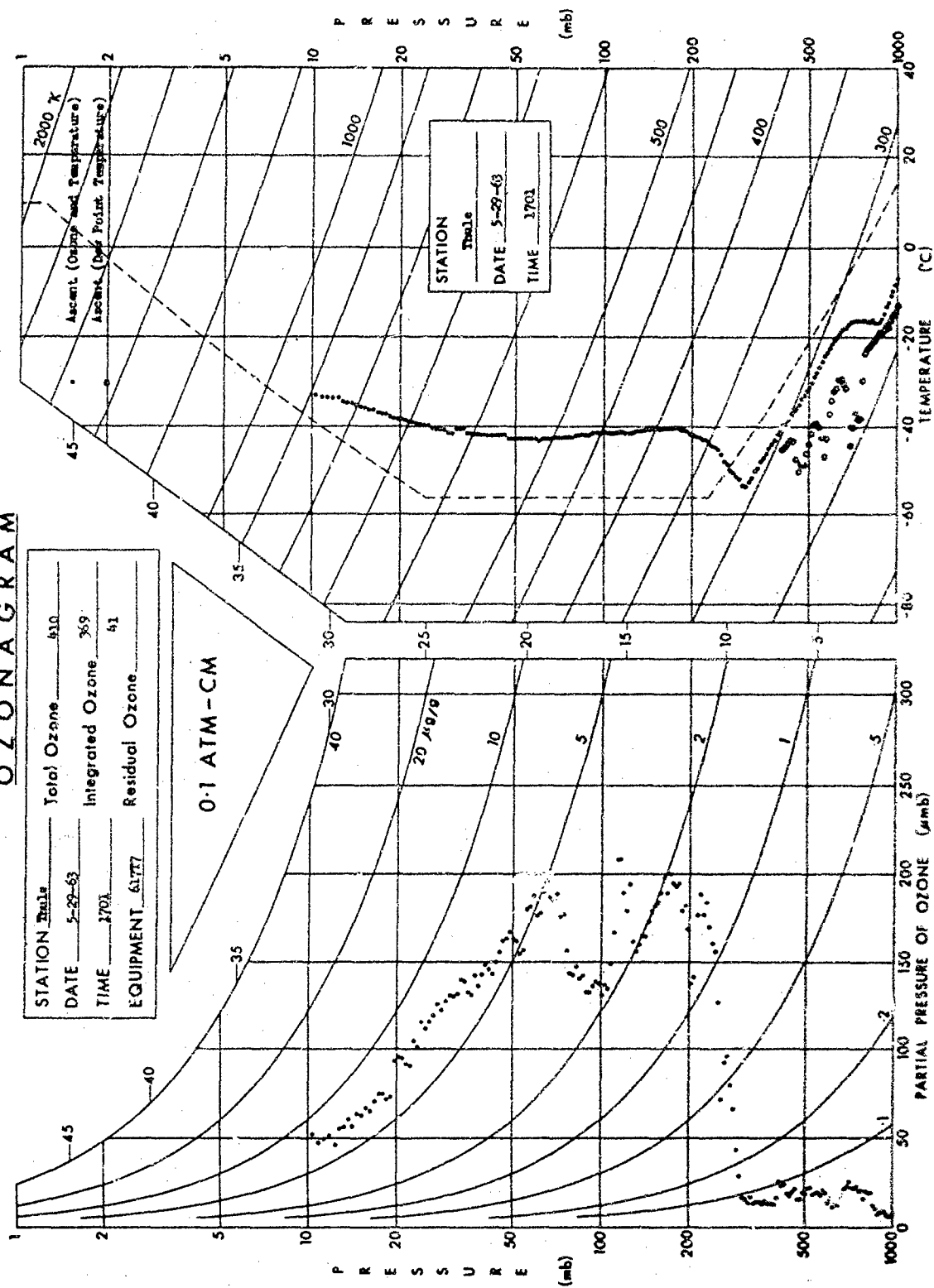
## OZONAGRAM



## OZONAGRAM



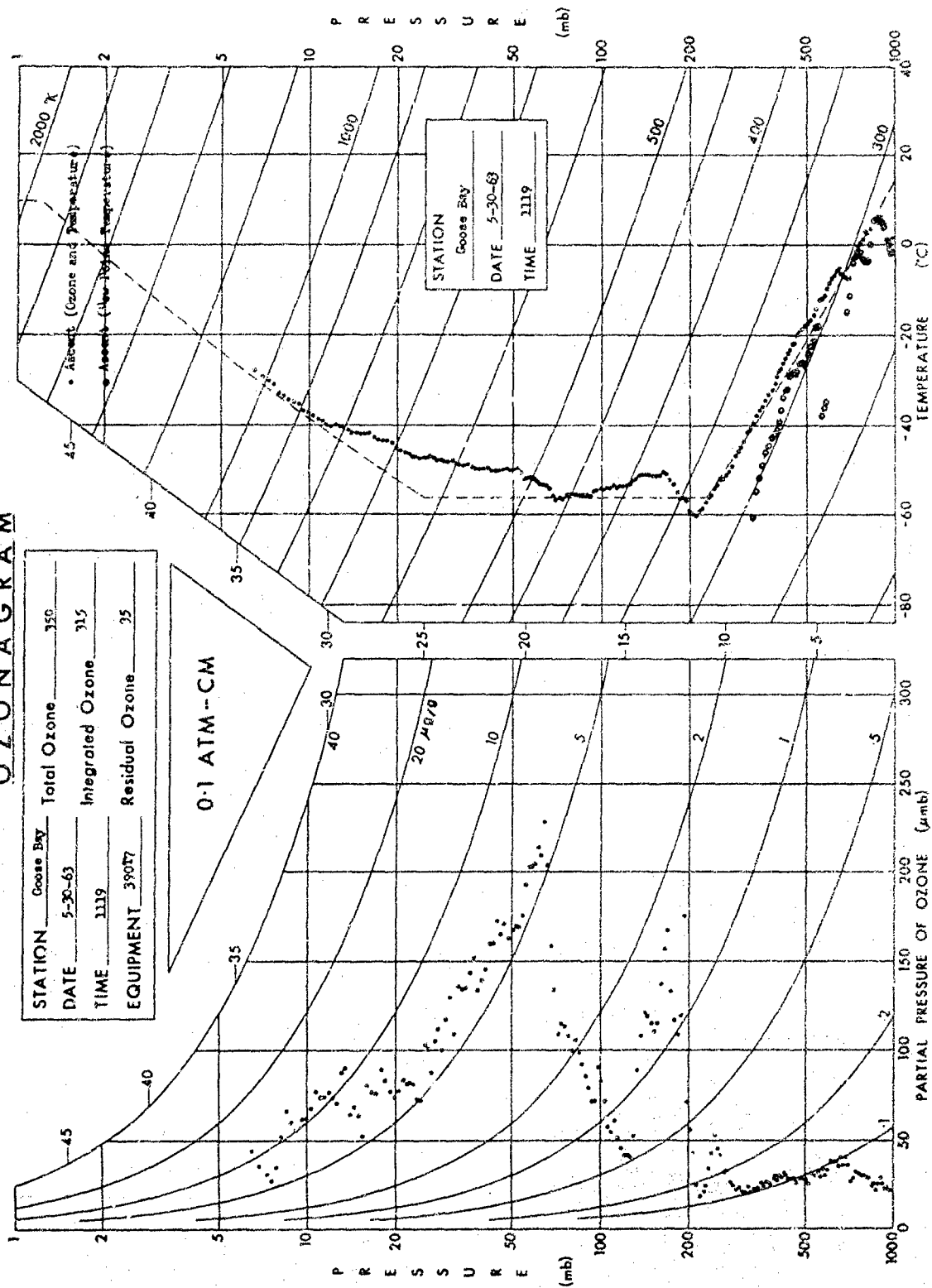
## OZONAGRAM



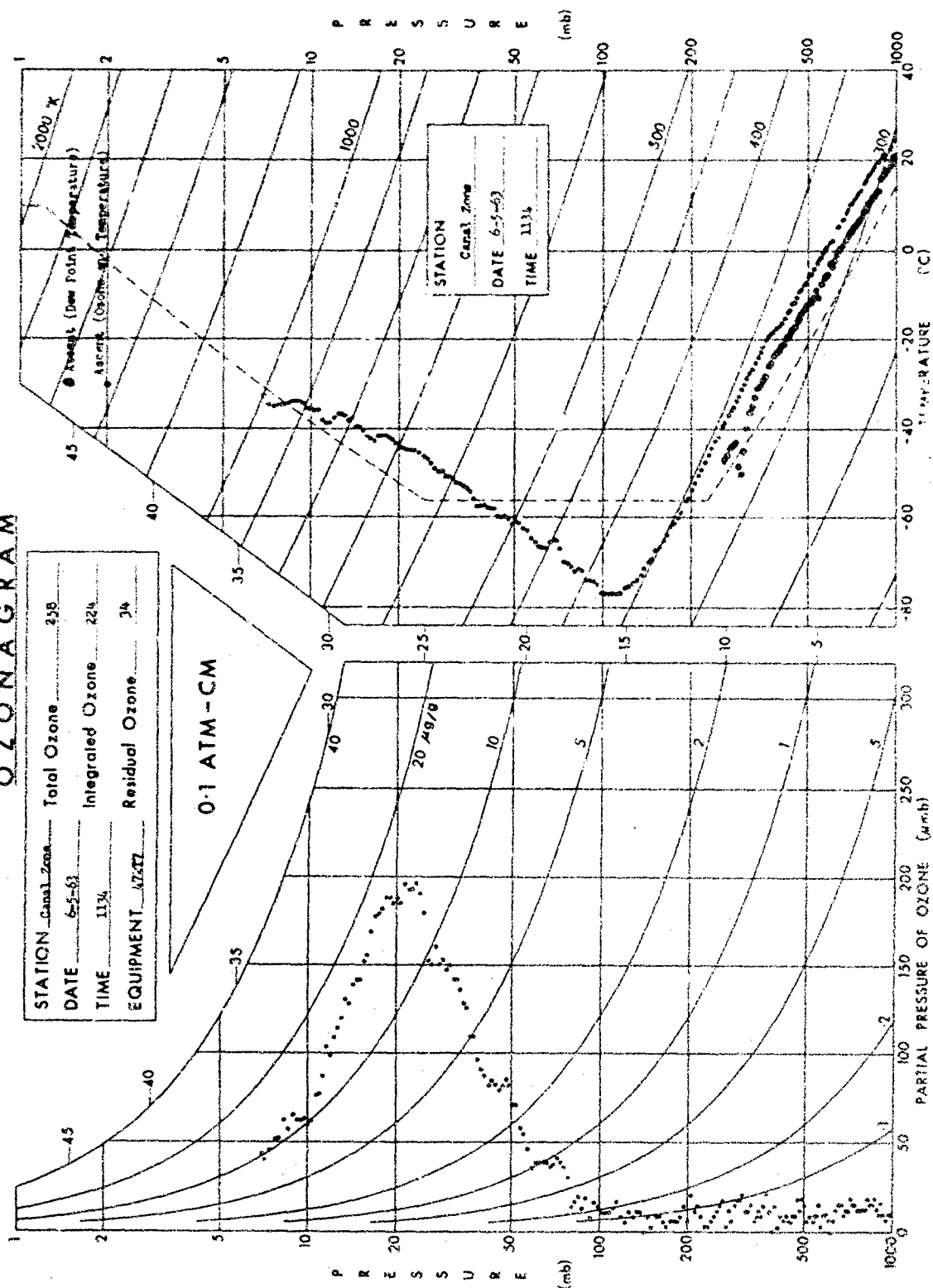
## OZONAGRAM

STATION	Goose Bay	Total Ozone	350
DATE	5-30-63	Integrated Ozone	315
TIME	1119	Residual Ozone	25
EQUIPMENT	39077		

0.1 ATM - CM



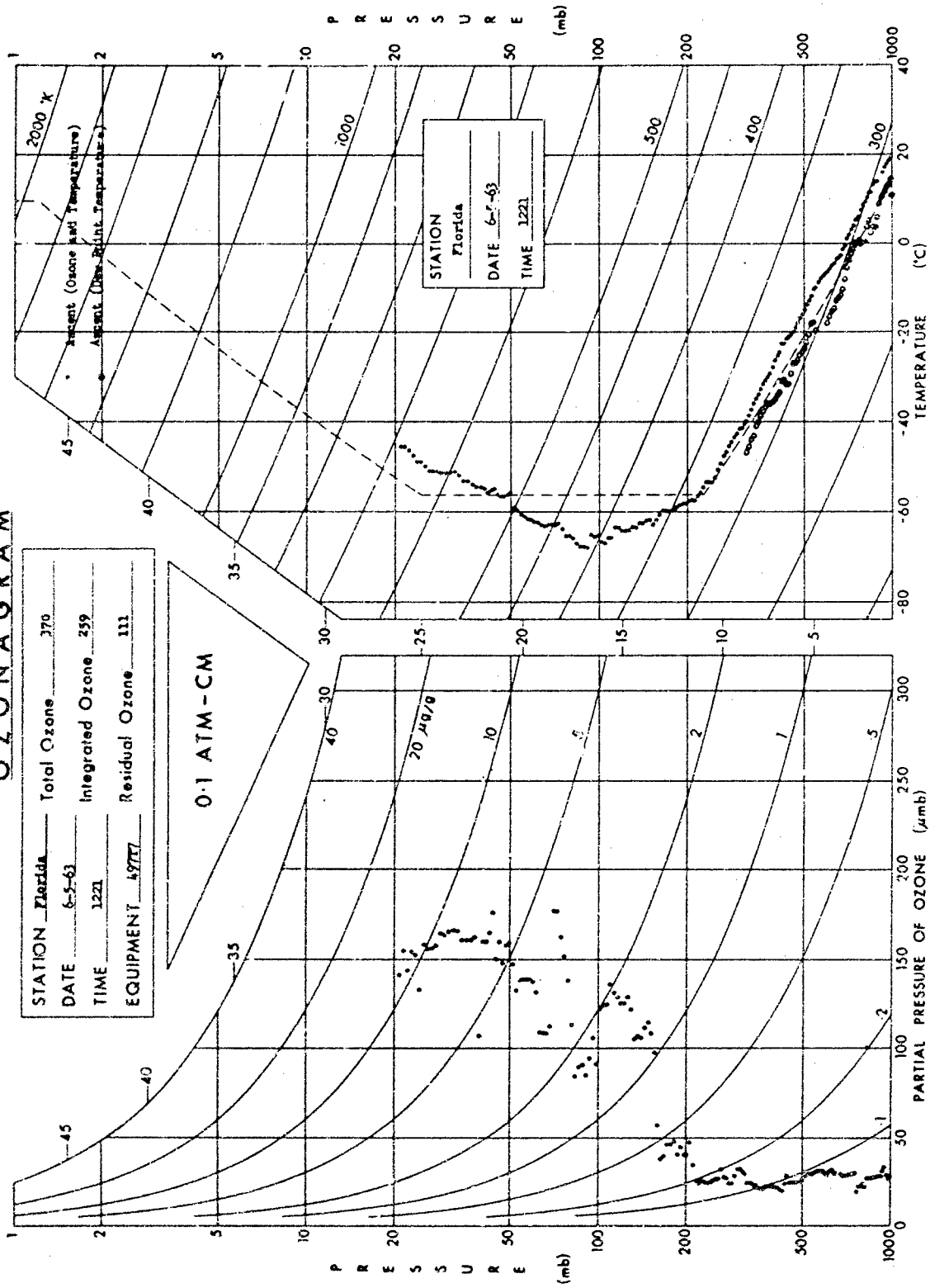
## O Z O N A G R A M



## OZONAGRAM

STATION	Florida	Total Ozone	370
DATE	6-5-63	Integrated Ozone	239
TIME	1221	Residual Ozone	111
EQUIPMENT	49777		

0.1 ATM-CM

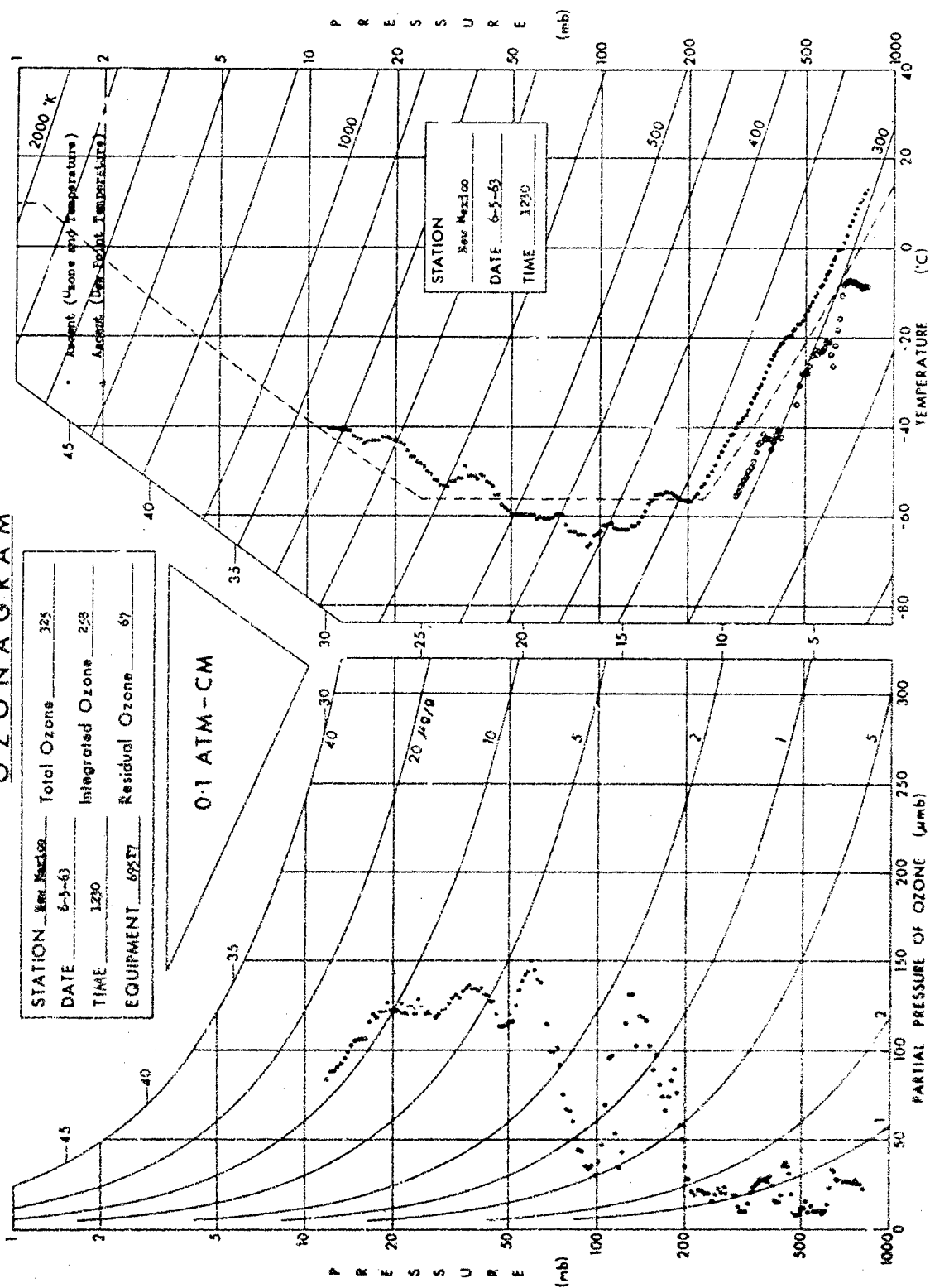




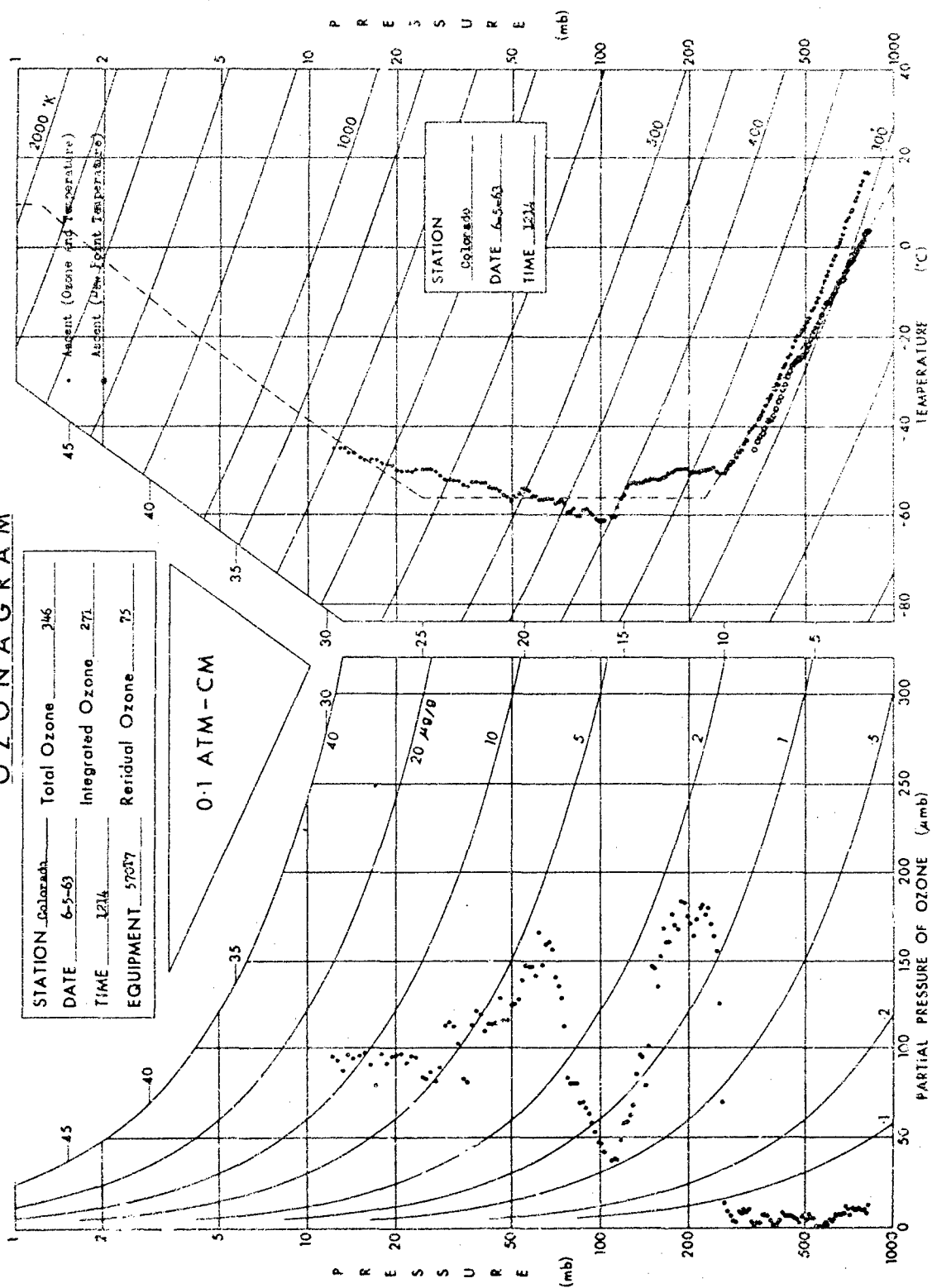
## OZONAGRAM

STATION New Mexico Total Ozone 385  
 DATE 6-5-63 Integrated Ozone 259  
 TIME 1230 Residual Ozone 67  
 EQUIPMENT 69517

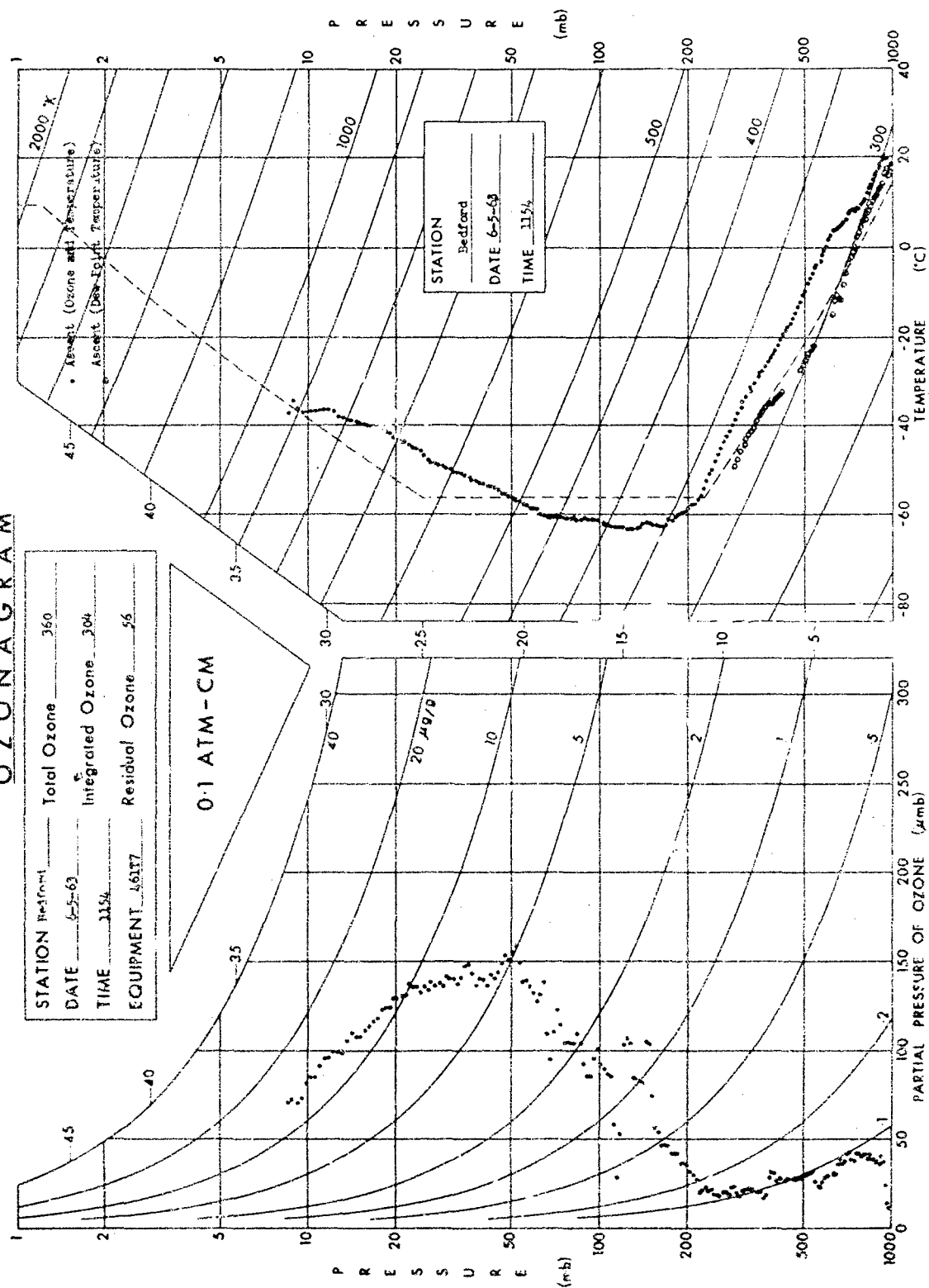
0.1 ATM-CM



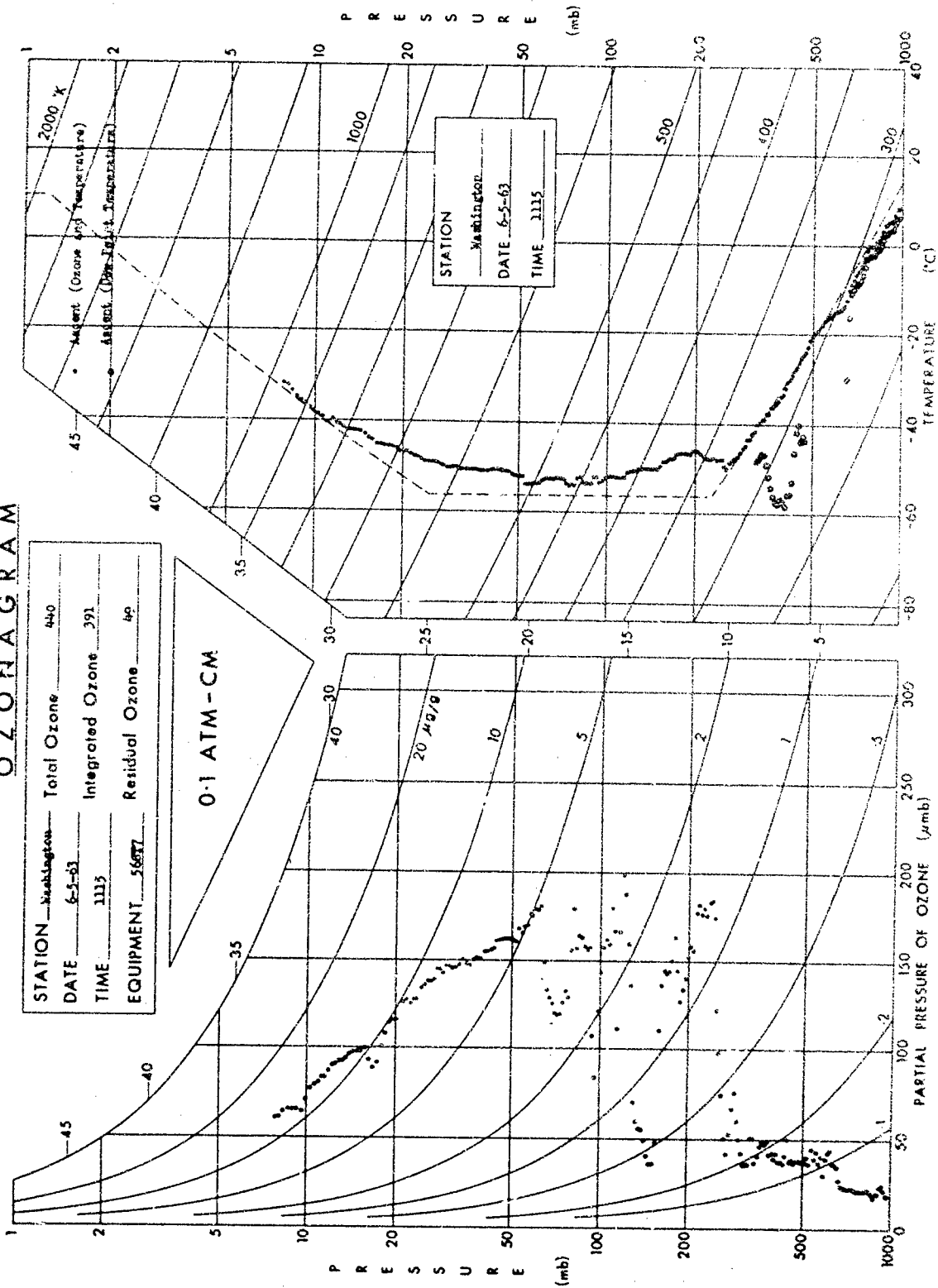
## OZONAGRAM



## OZONAGRAM



## OZONAGRAM

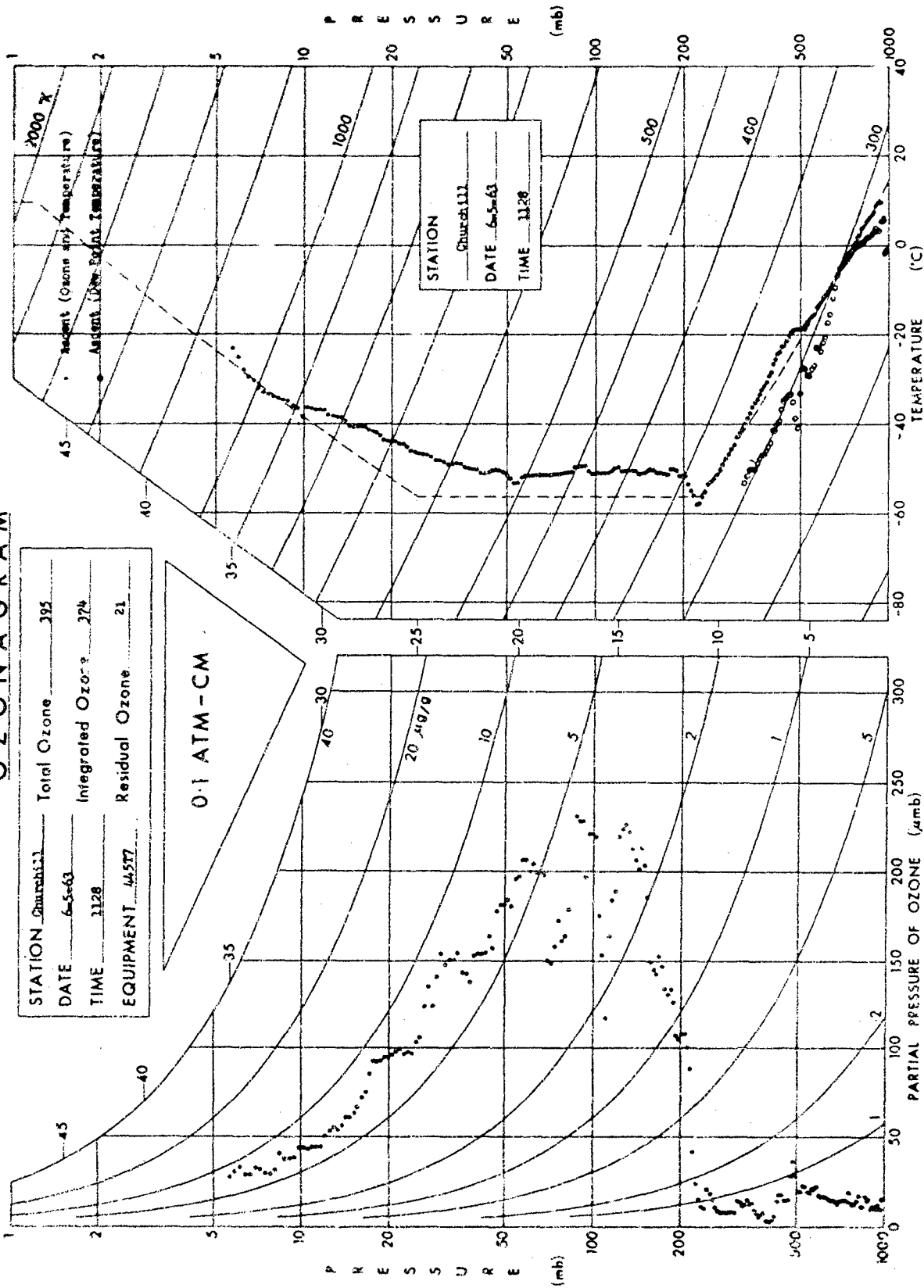


## OZONAGRAM

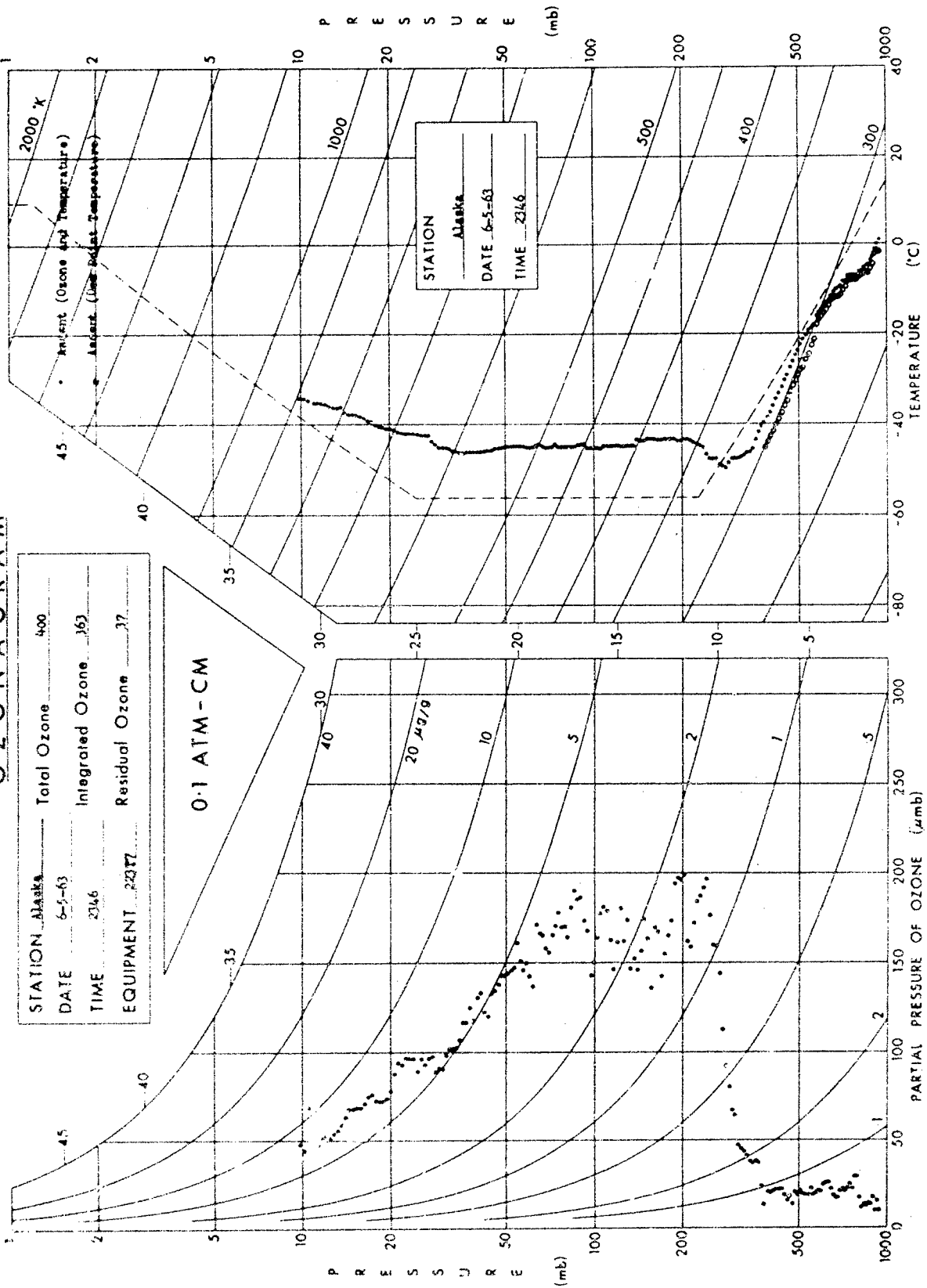
STATION Churchill  
 DATE 6-5-63  
 TIME 1128  
 EQUIPMENT 44577

Total Ozone 395  
 Integrated Ozone 274  
 Residual Ozone 21

0.1 ATM-CM



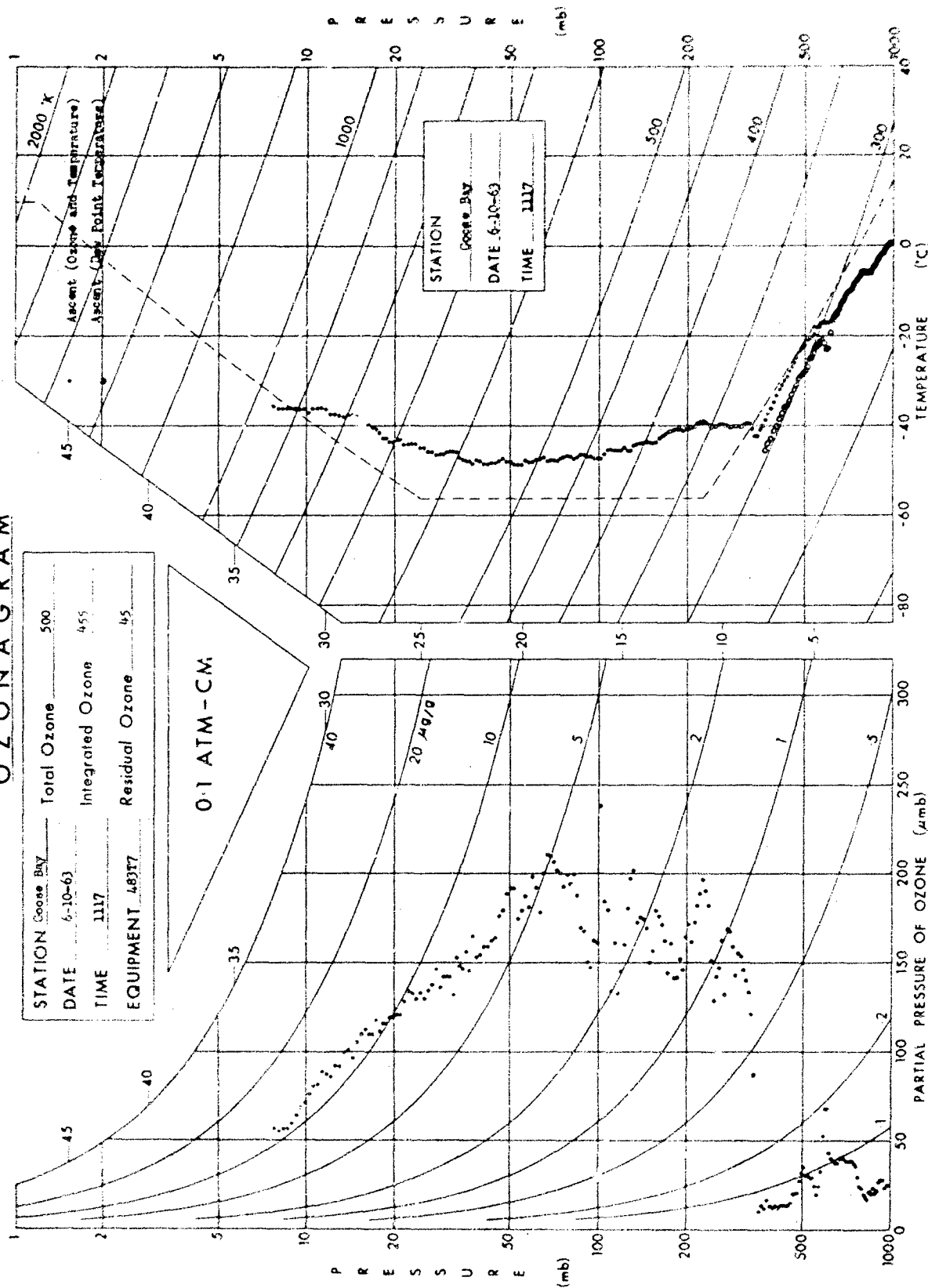
## O Z O N A G R A M



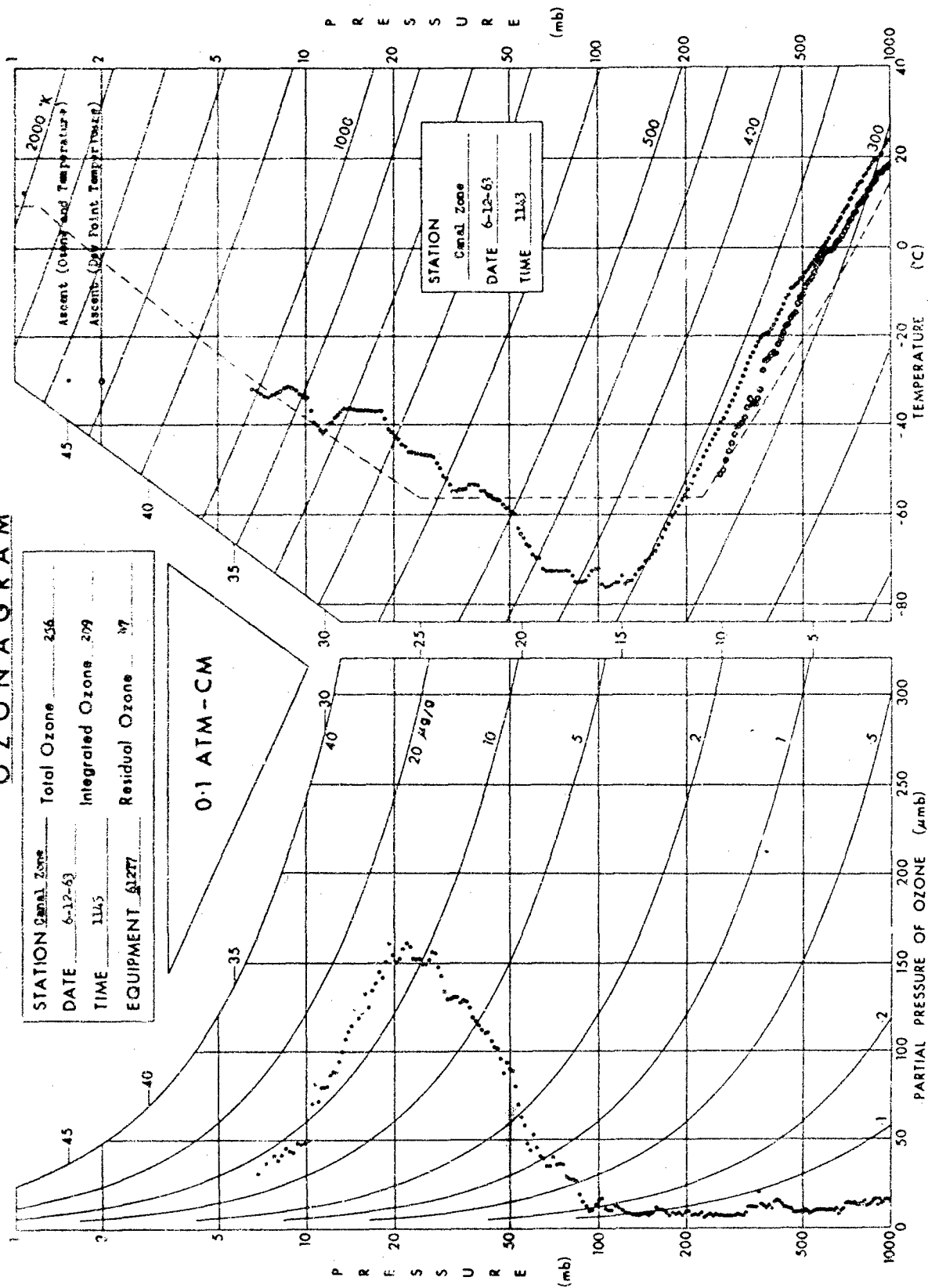
# OZONAGRAM

STATION	Goose Bay	Total Ozone	500
DATE	6-10-63	Integrated Ozone	455
TIME	1117	Residual Ozone	45
EQUIPMENT	48377		

0.1 ATM-CM:



## O Z O N A G R A M

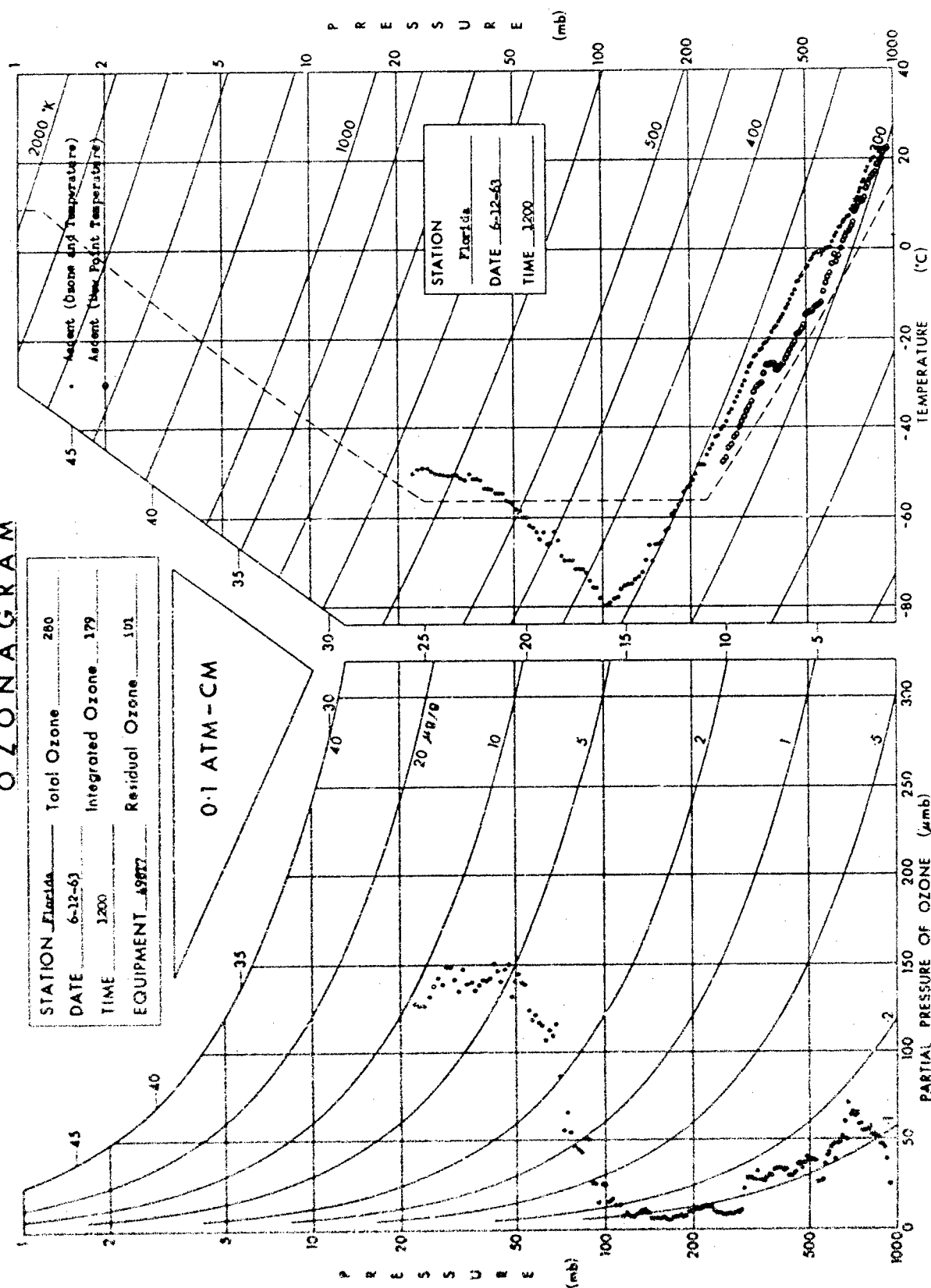




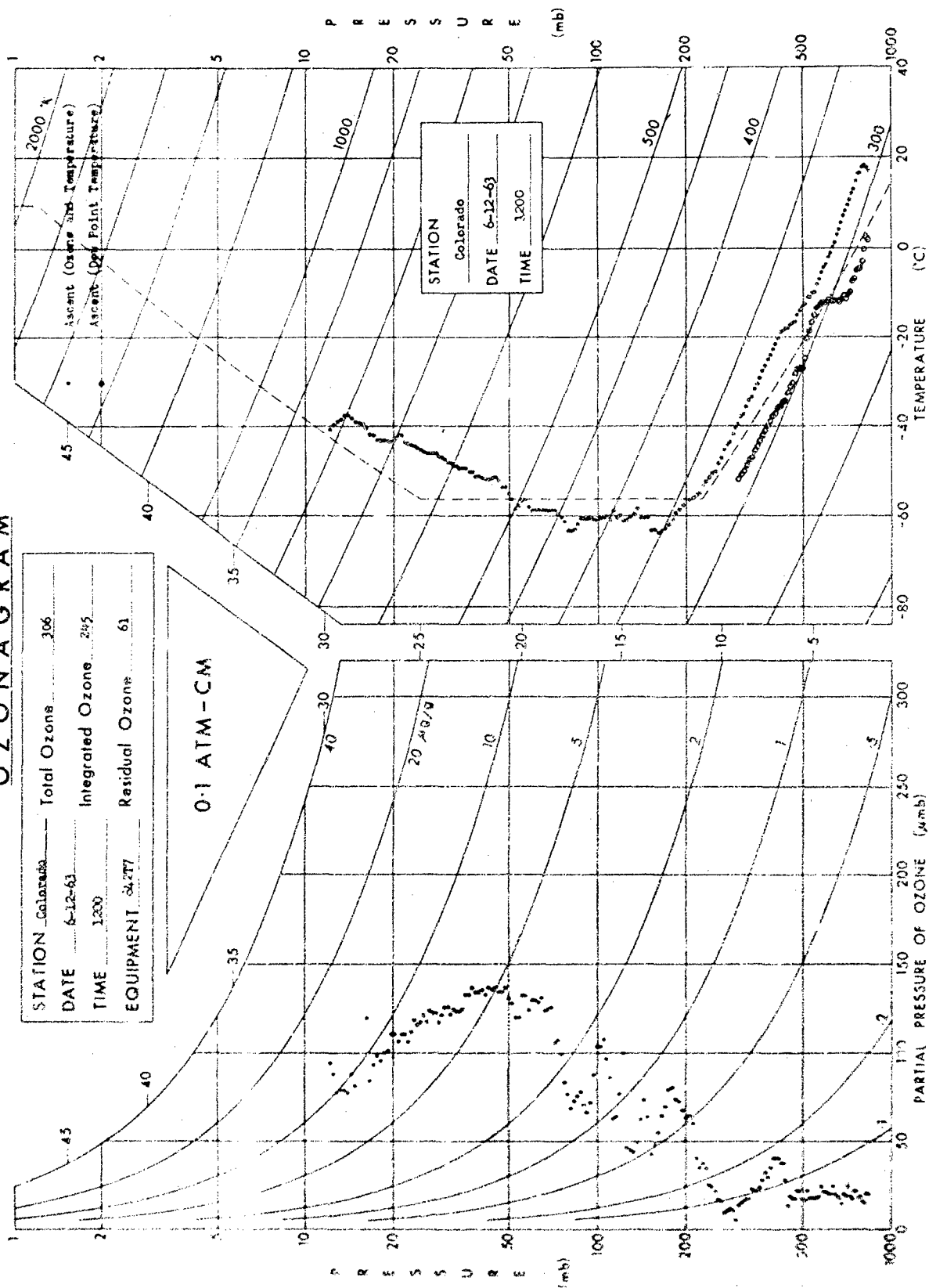
## O Z O N A G R A M

STATION Florida Total Ozone 280  
 DATE 6-12-63 Integrated Ozone 179  
 TIME 1200 Residual Ozone 101  
 EQUIPMENT 498T2

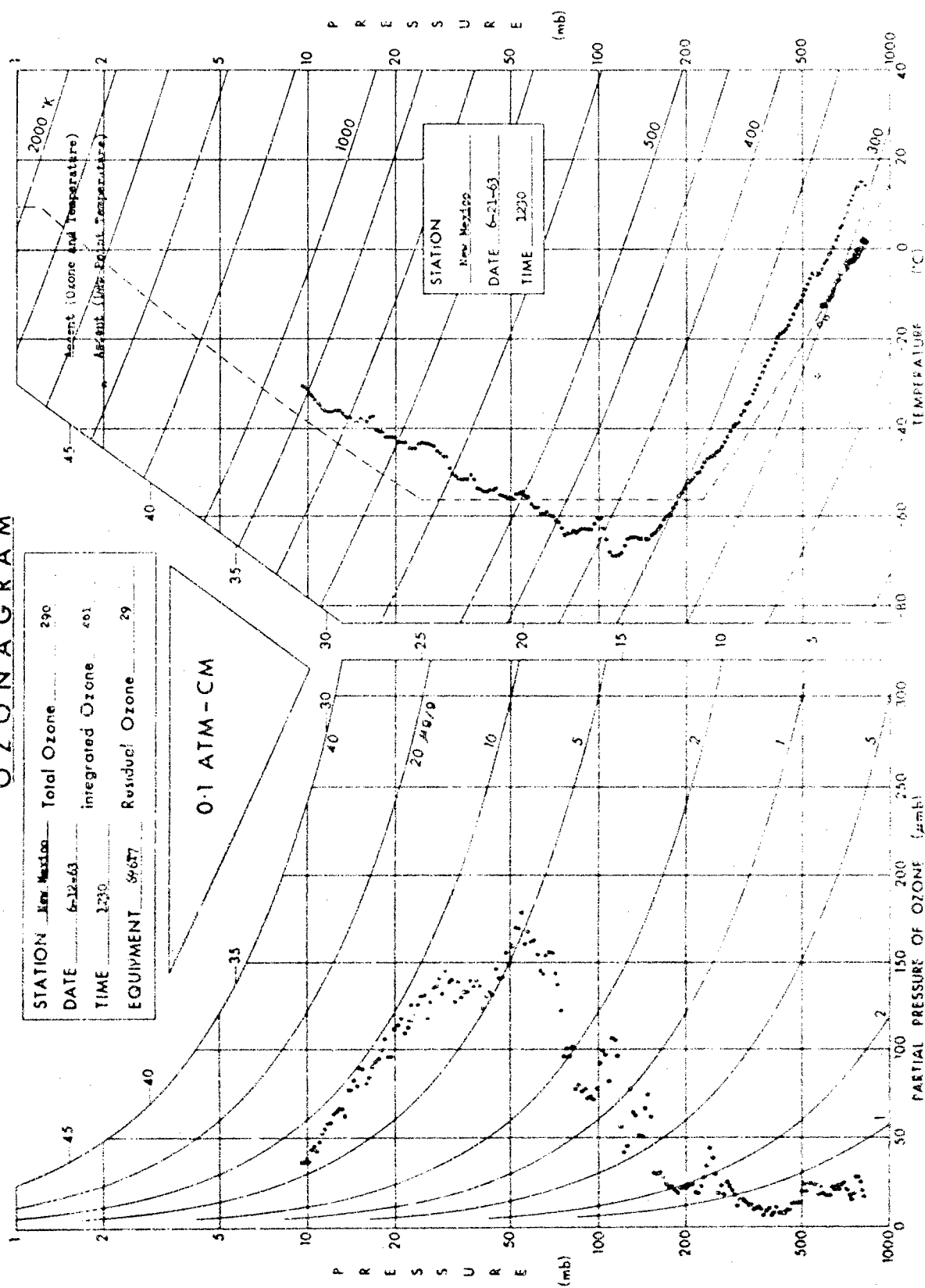
0.1 ATM-CM



# O Z O N A G R A M



## OZONAGRAM

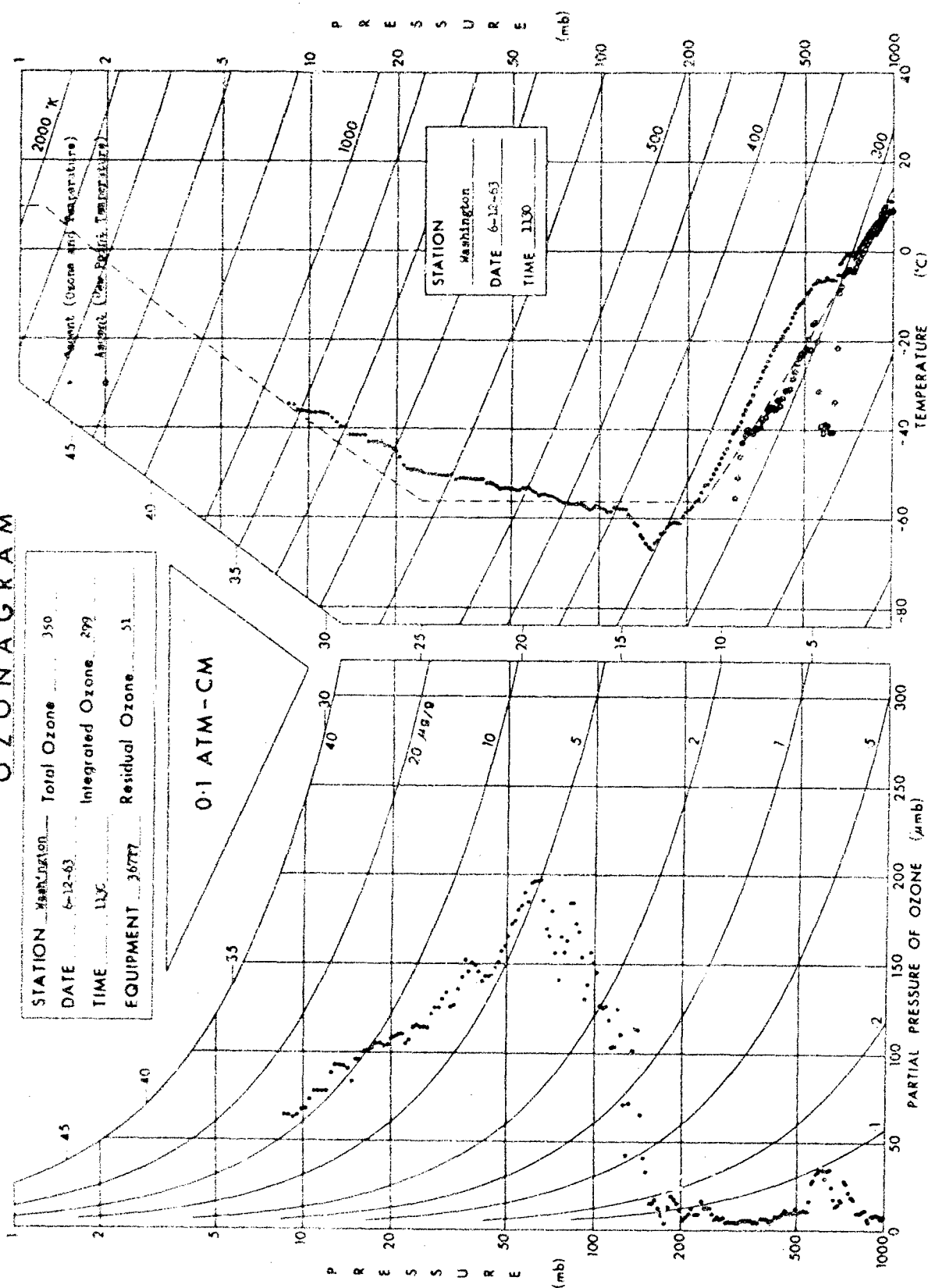


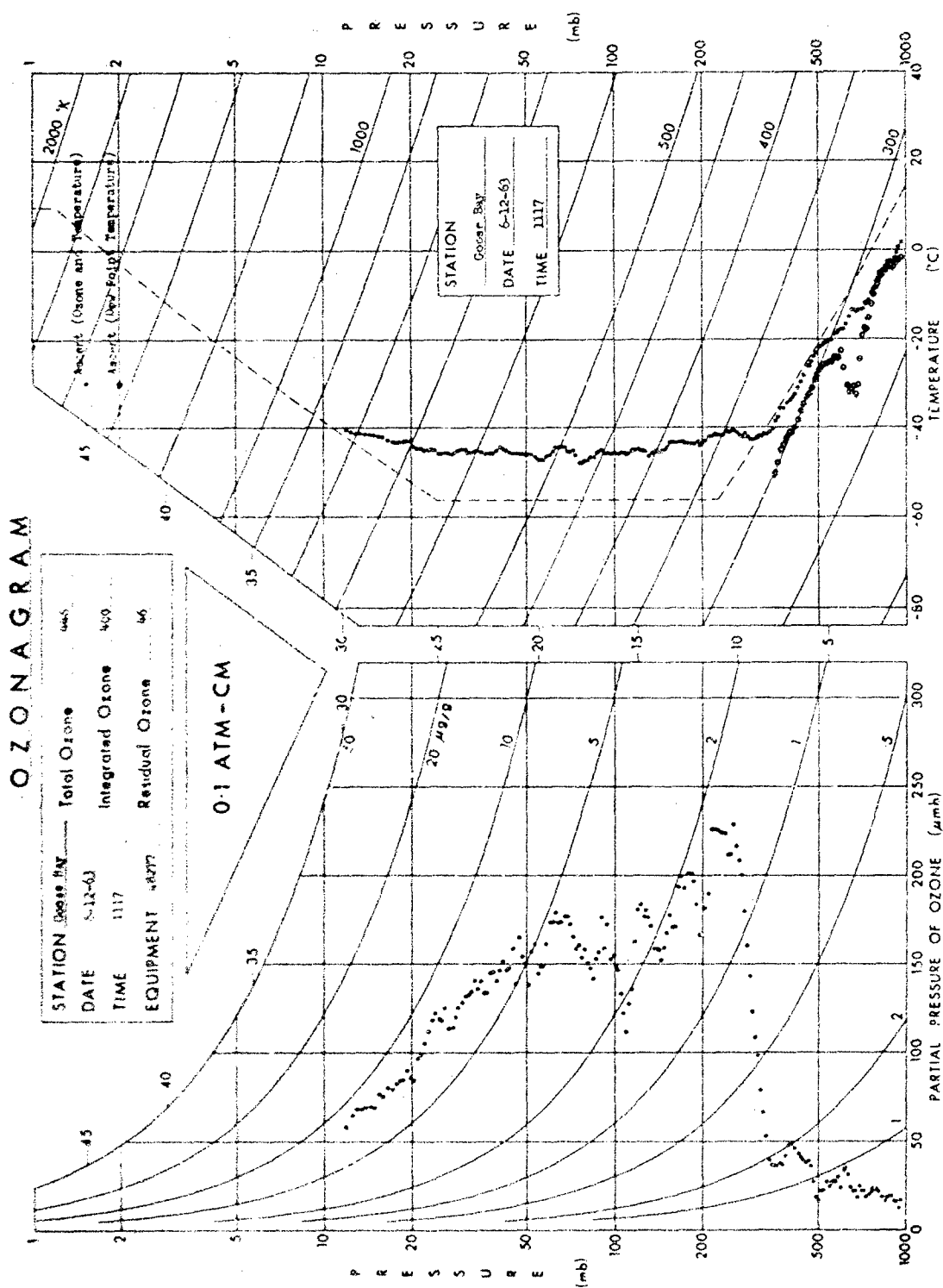


## OZONAGRAM

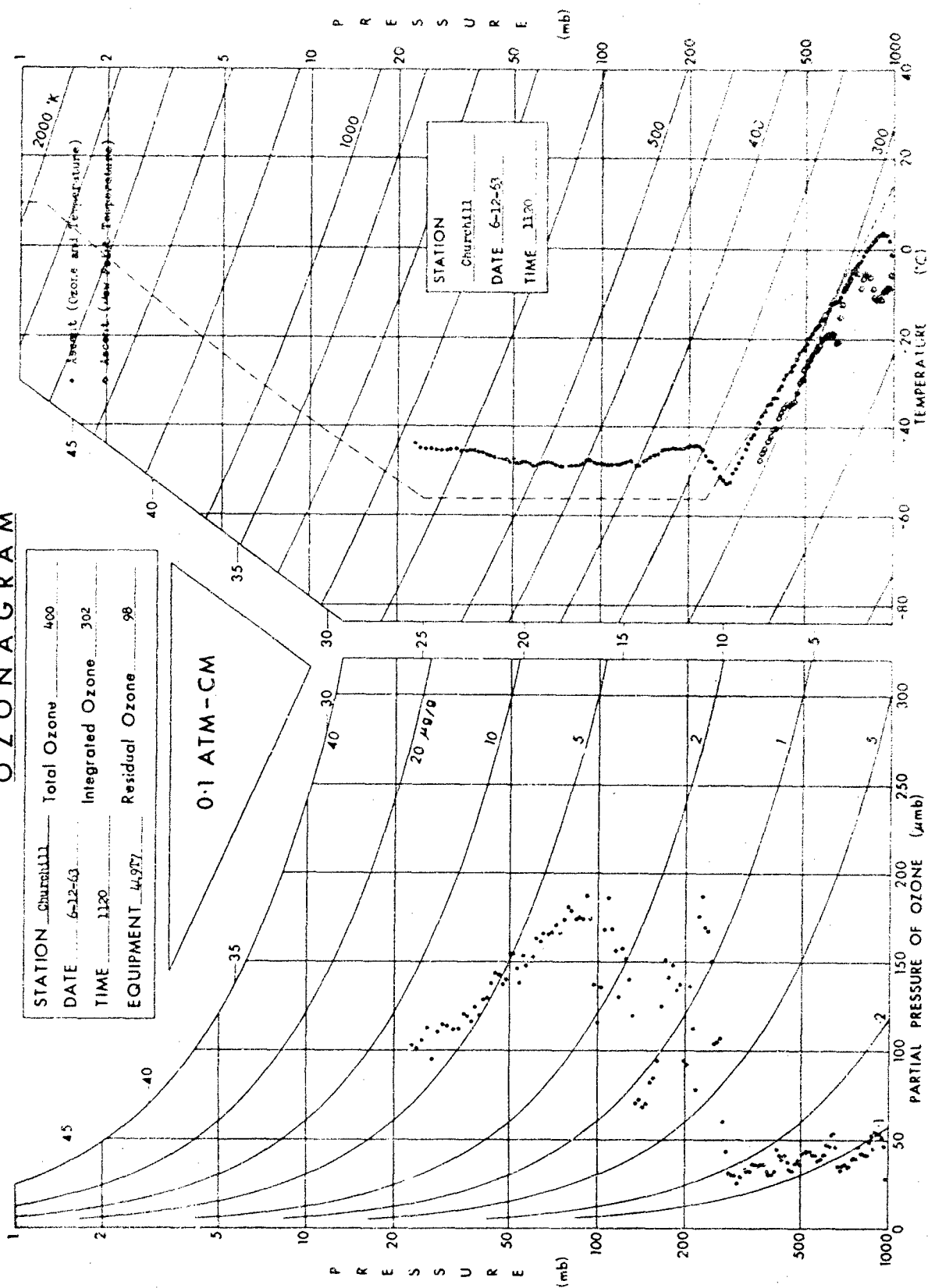
STATION Washington Total Ozone 350  
 DATE 6-12-63 Integrated Ozone 299  
 TIME 1130 Residual Ozone 51  
 EQUIPMENT 36777

0.1 ATM - CM

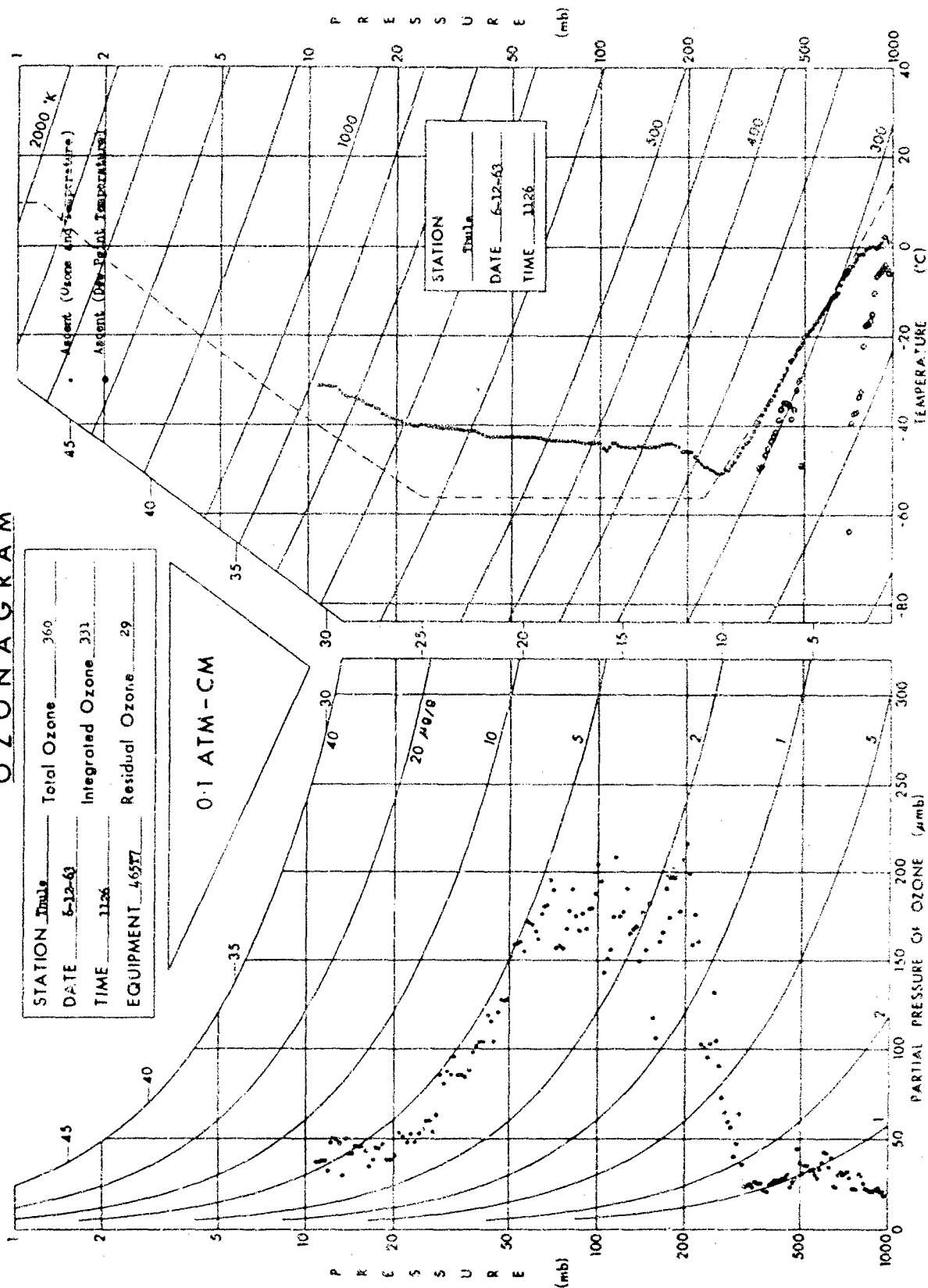




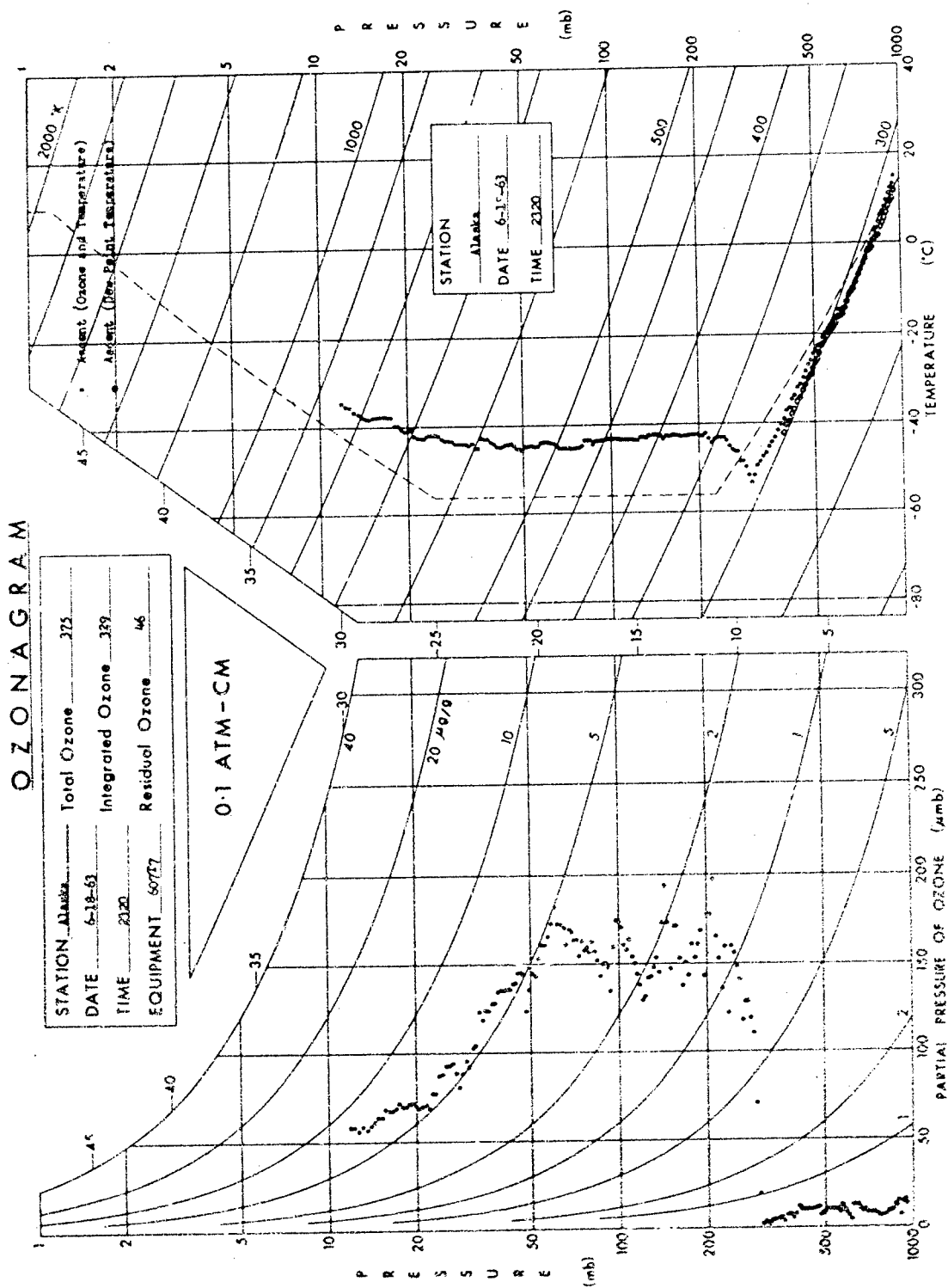
## OZONAGRAM



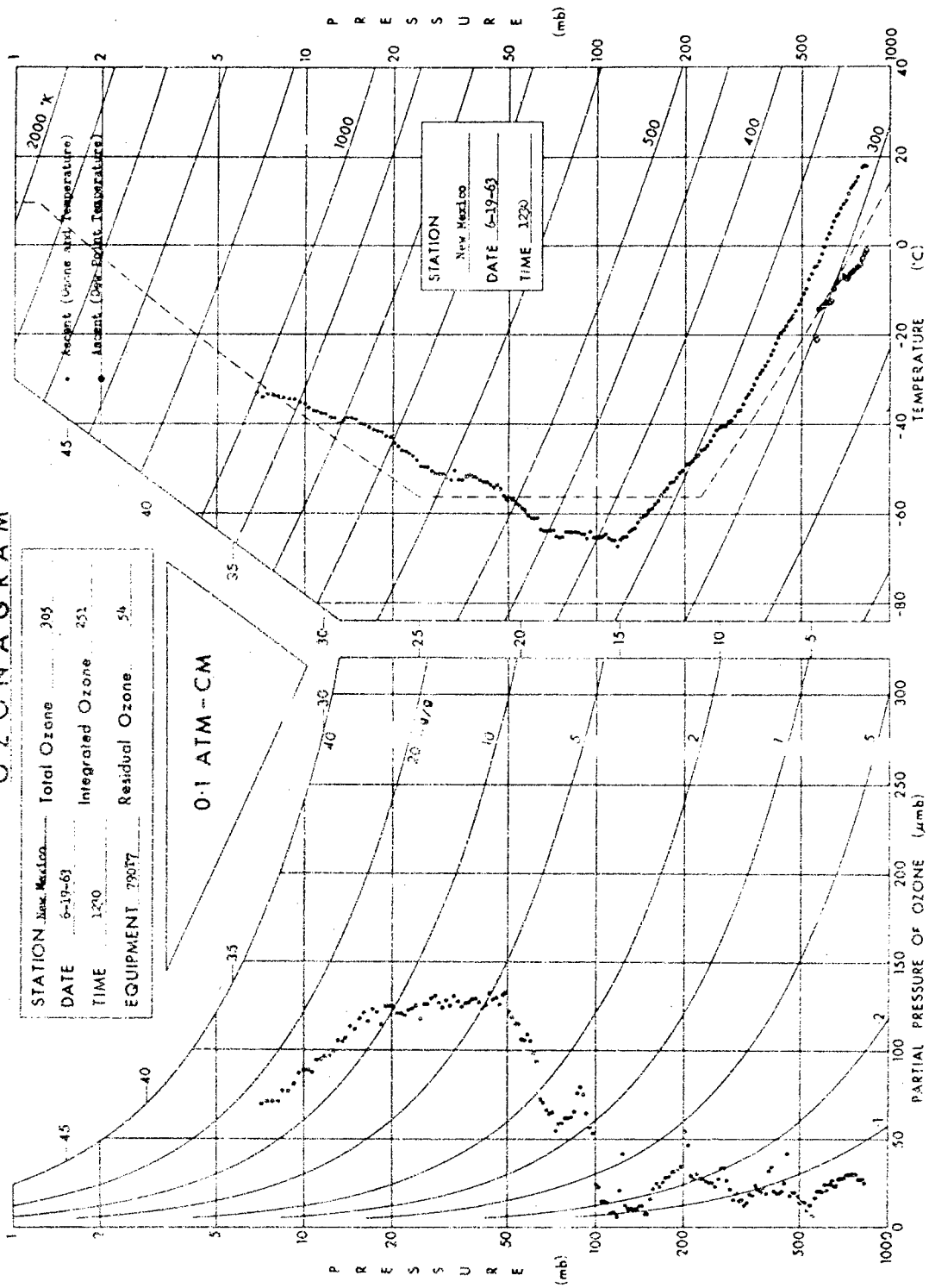
## O Z O N A G R A M







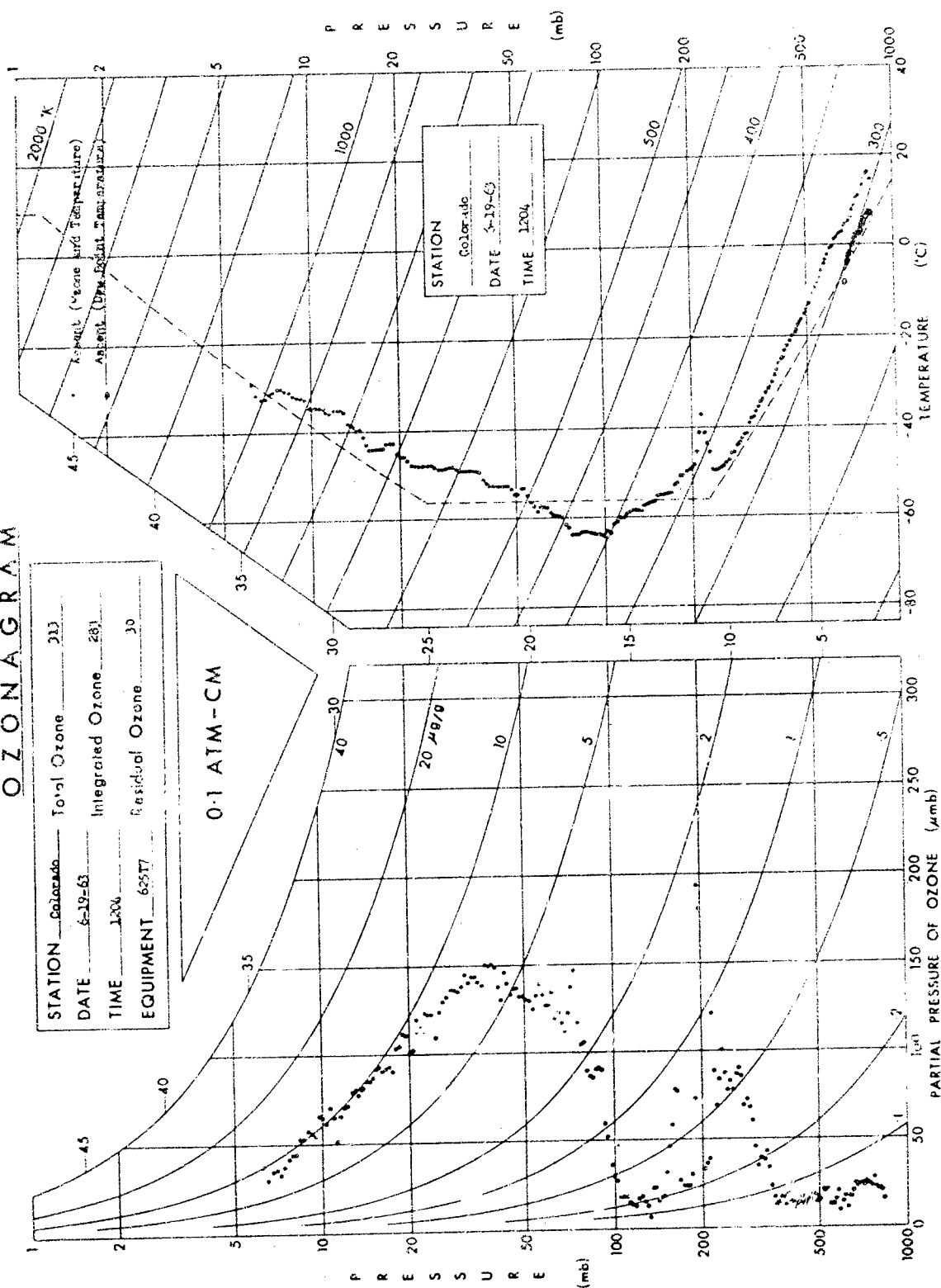
## O Z O N A G R A M



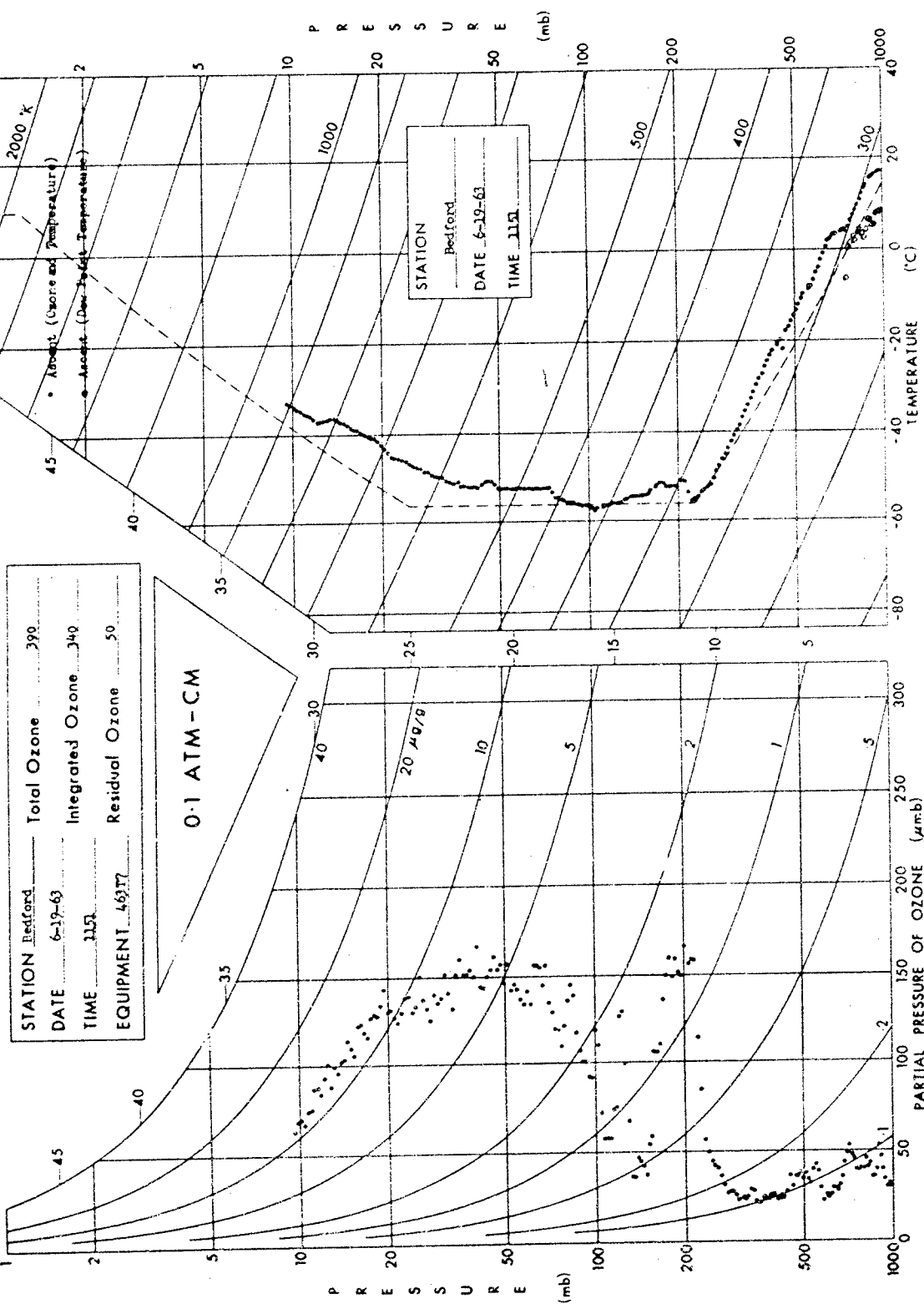
## O Z O N A G R A M

STATION	Colorado	Total Ozone	313
DATE	6-19-63	Integrated Ozone	281
TIME	1204	Residual Ozone	30
EQUIPMENT	62517		

0.1 ATM-CM



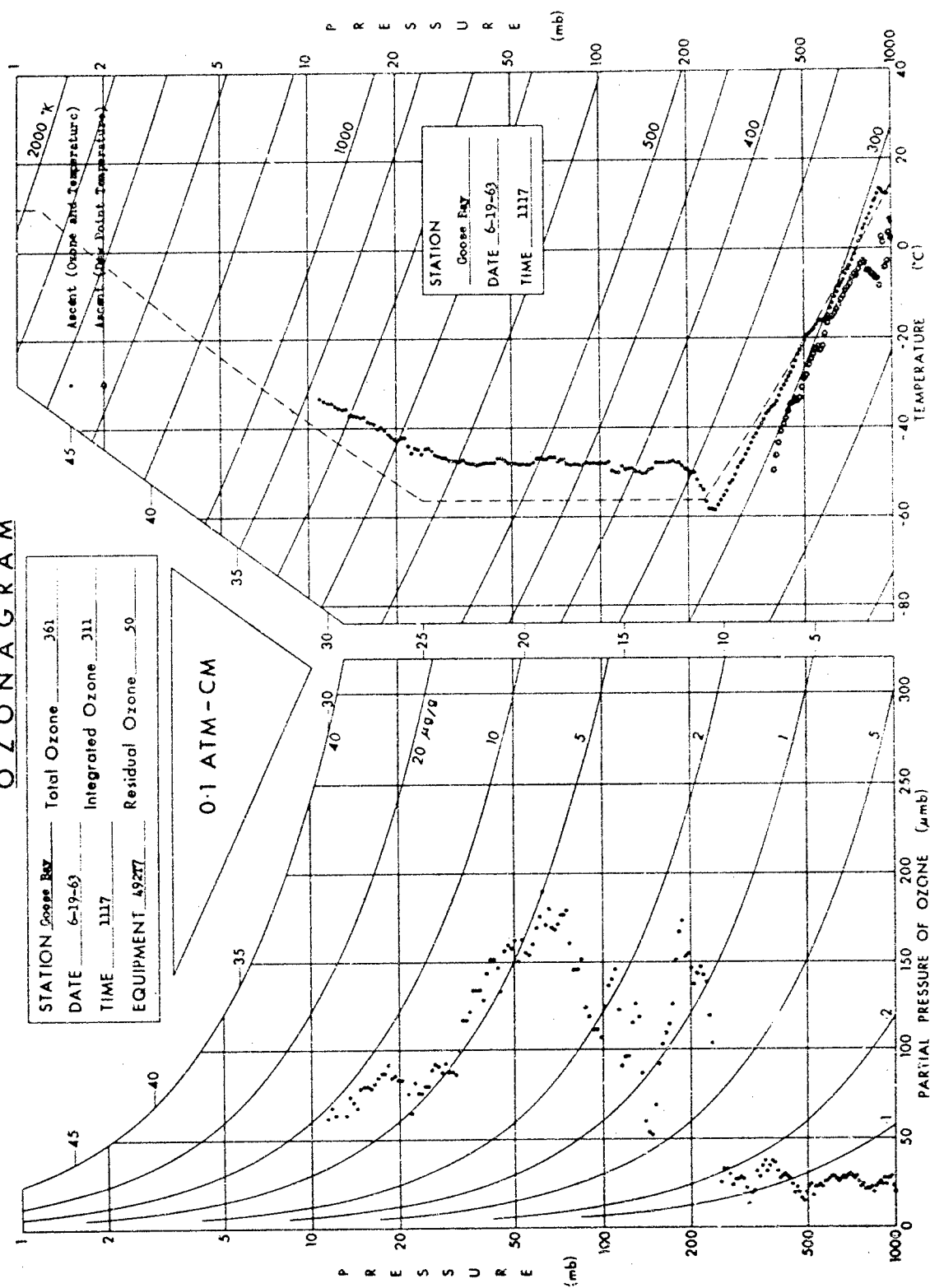
## O Z O N A G R A M

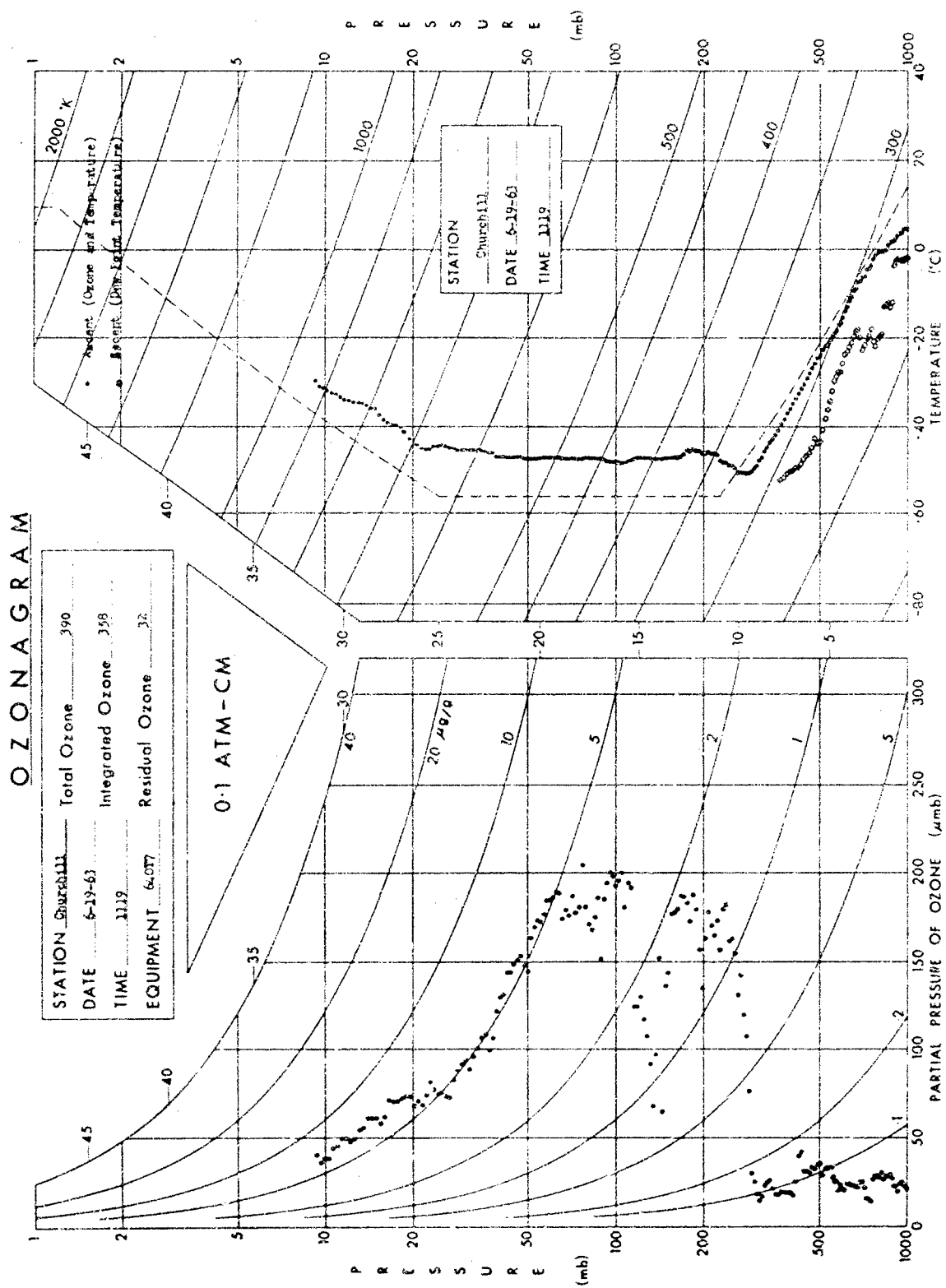


## OZONAGRAM

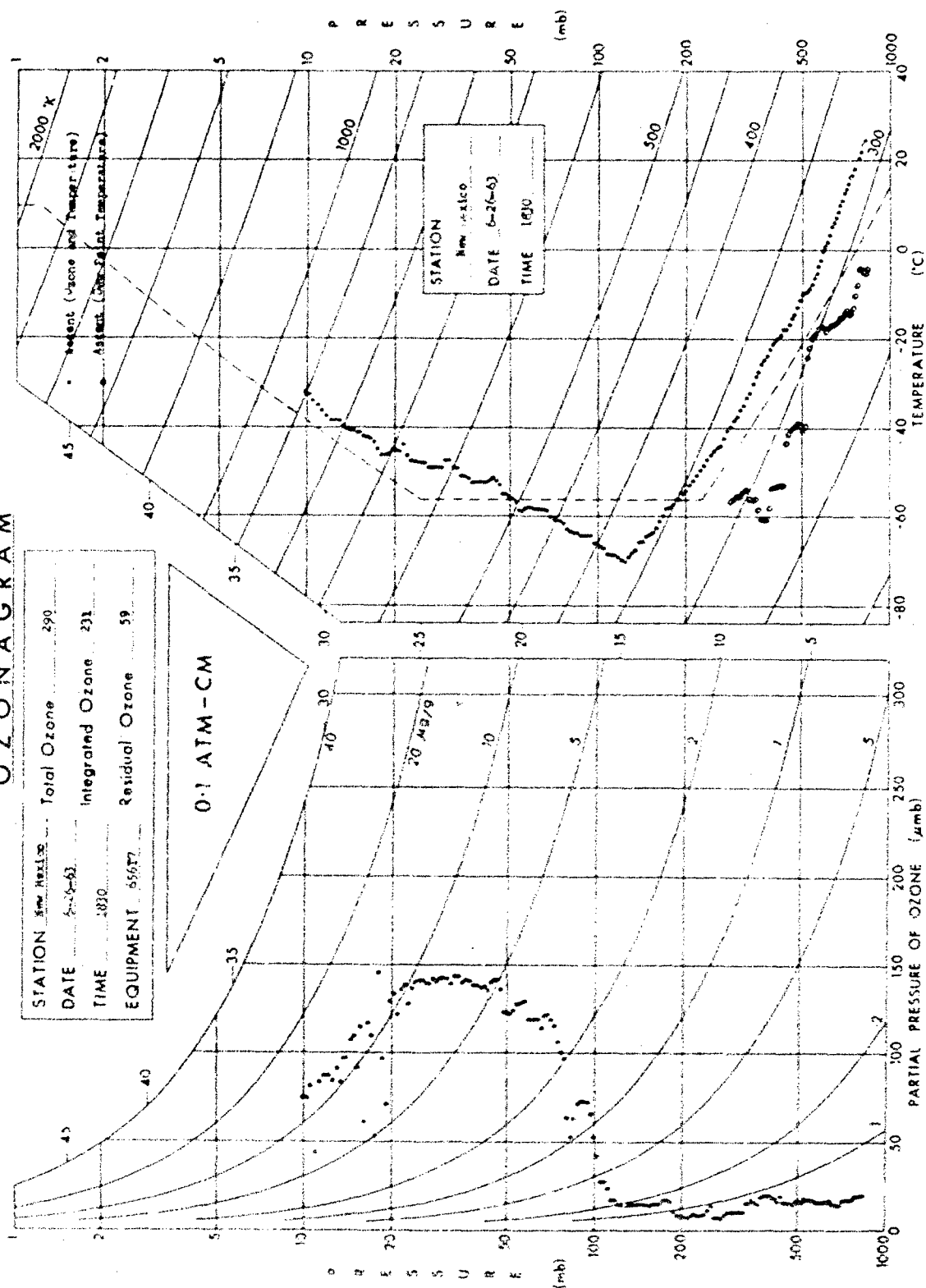
STATION Goose Bay Total Ozone 361  
 DATE 6-19-63 Integrated Ozone 311  
 TIME 1117 Residual Ozone 50  
 EQUIPMENT 49277

0.1 ATM-CM





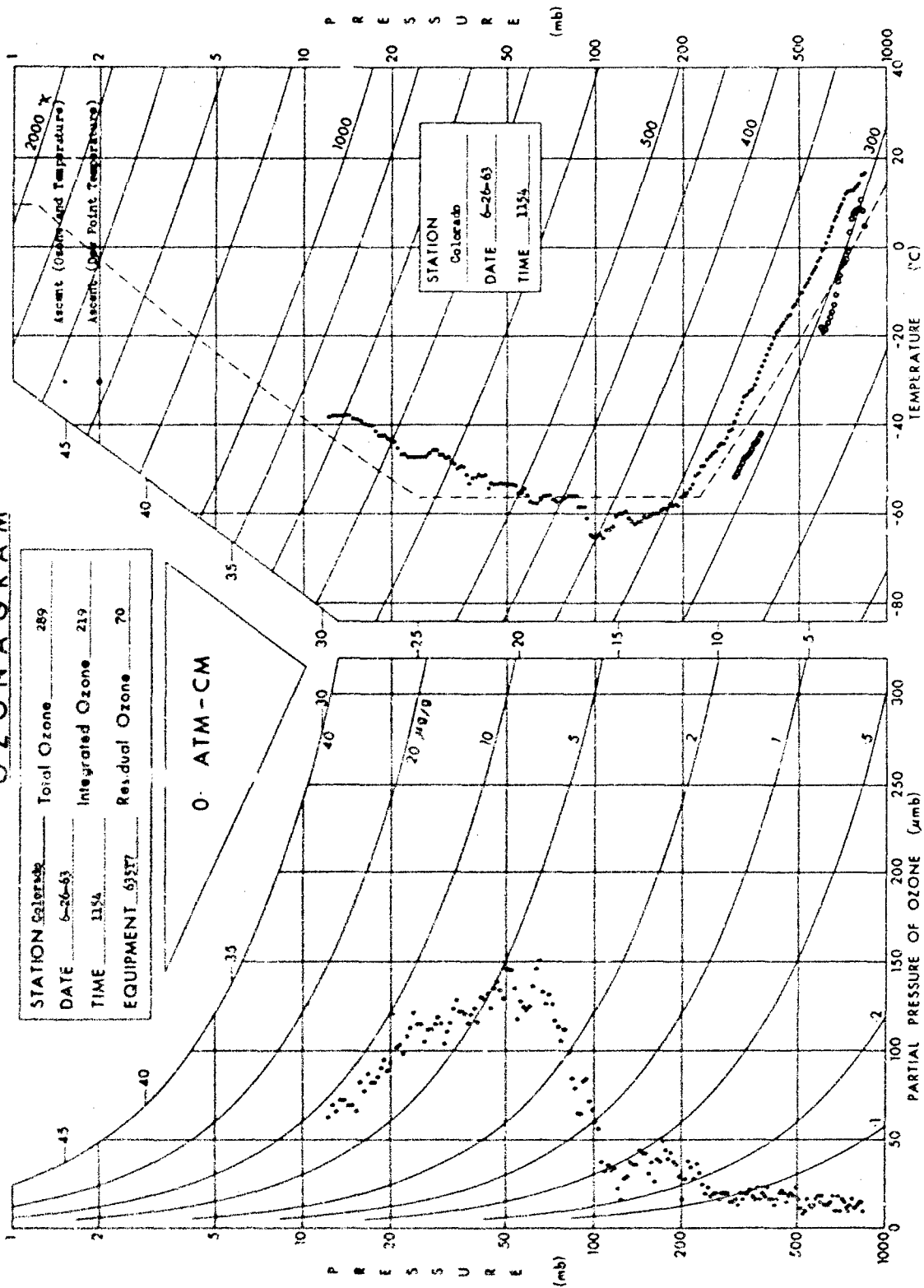
## O Z O N A G R A M



## O Z O N A G R A M

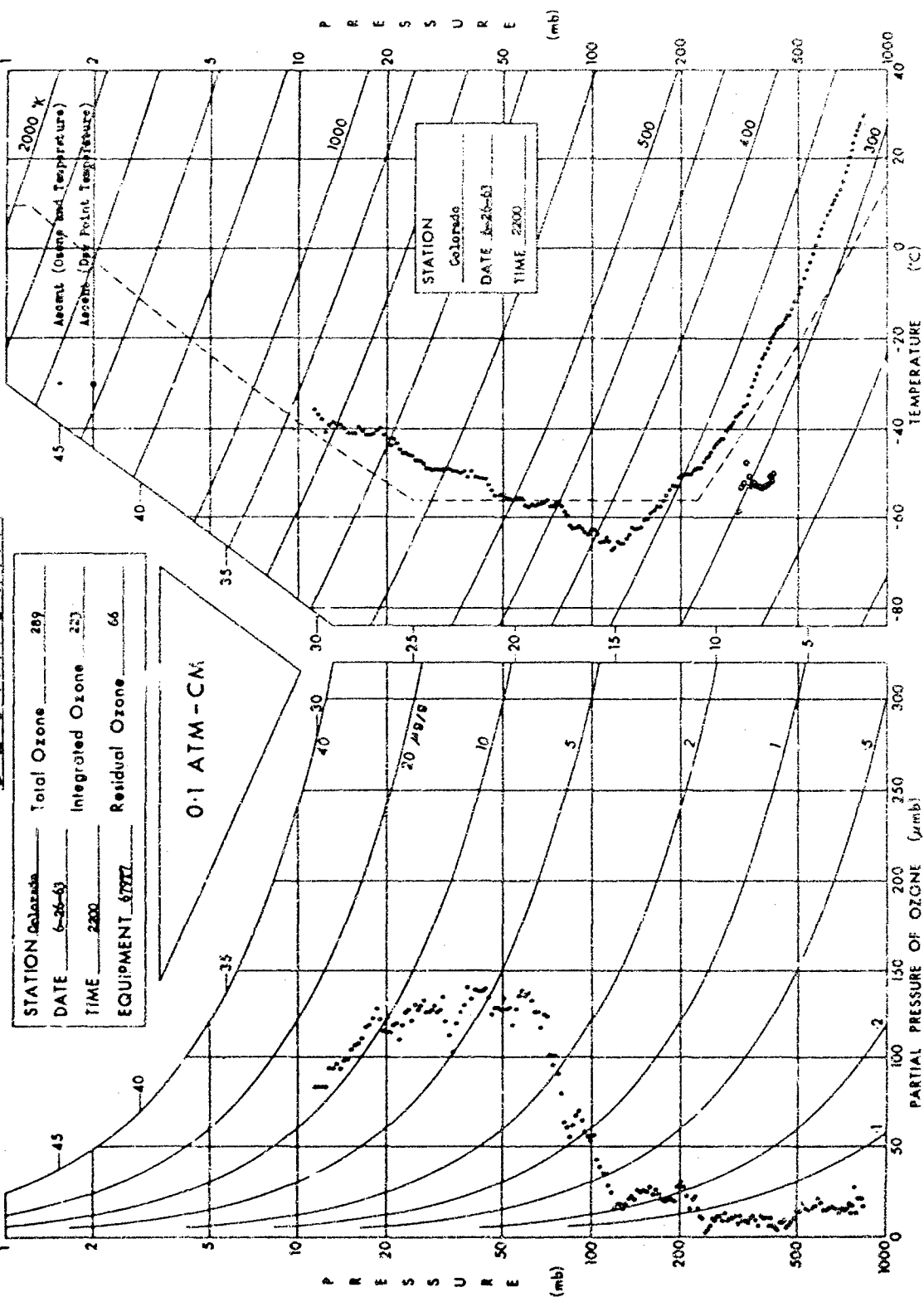
STATION	Colorado	Total Ozone	289
DATE	6-26-63	Integrated Ozone	219
TIME	1154	Residual Ozone	70
EQUIPMENT	6357		

0. ATM - CM



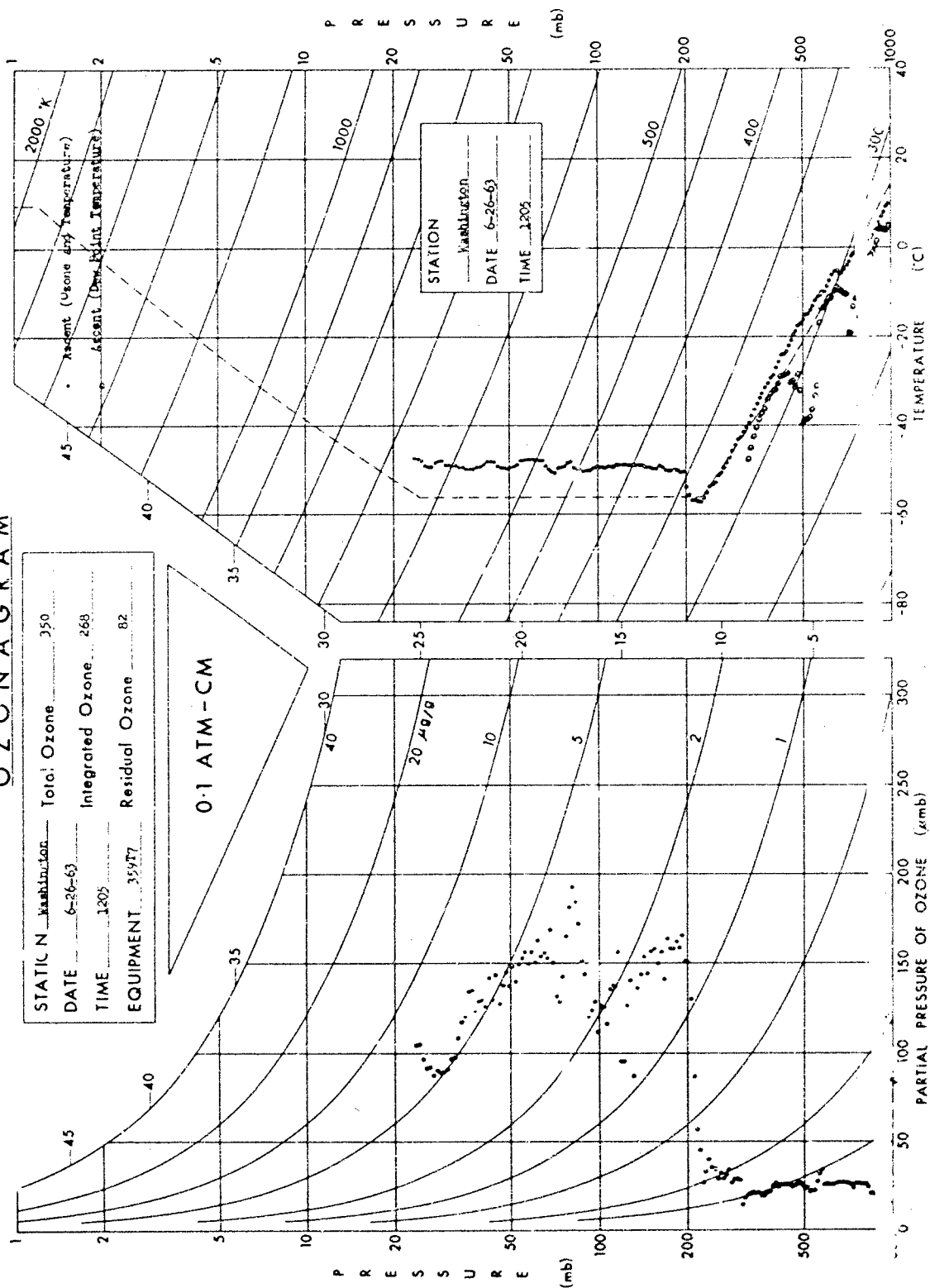


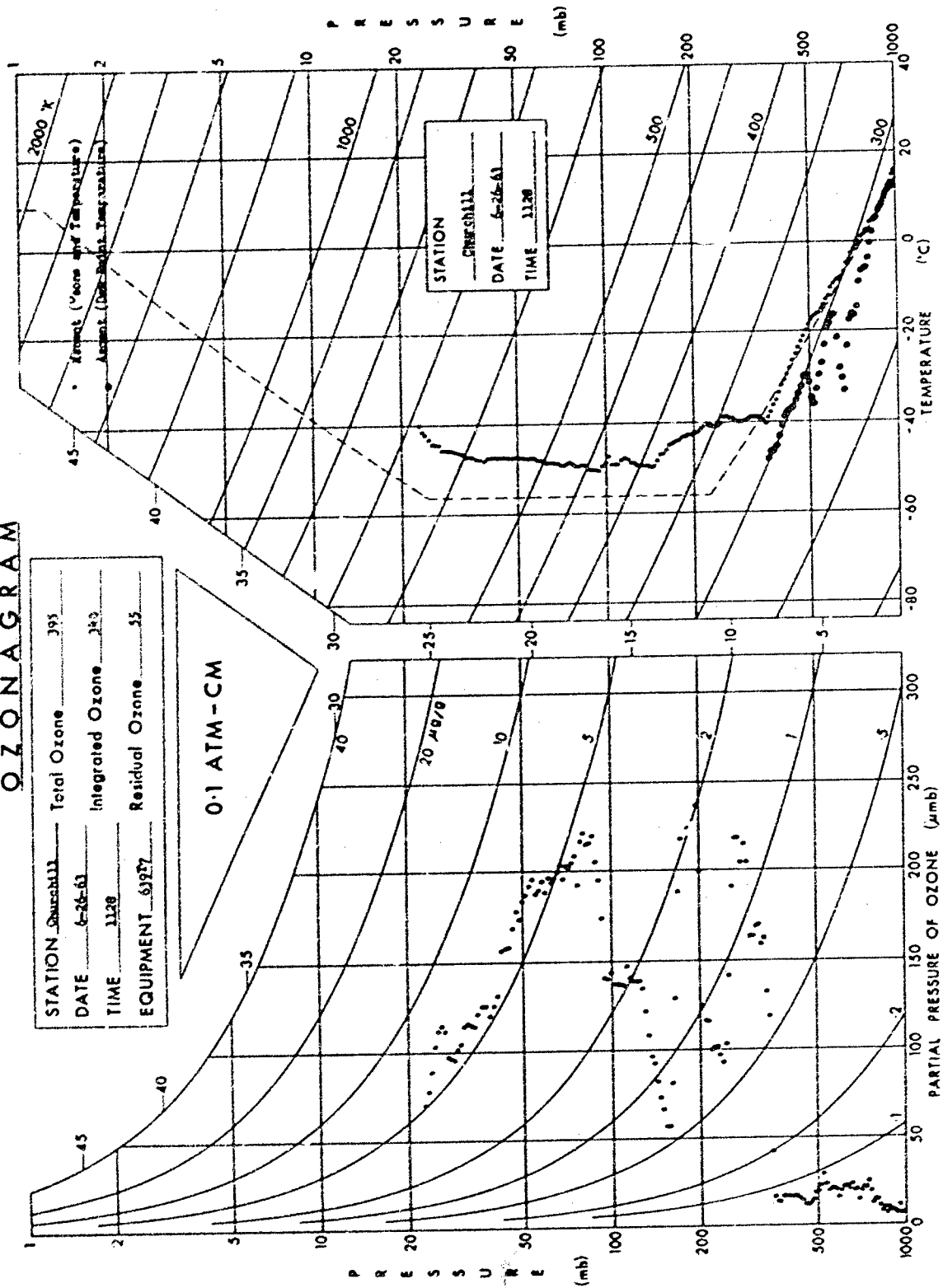
## OZONAGRAM



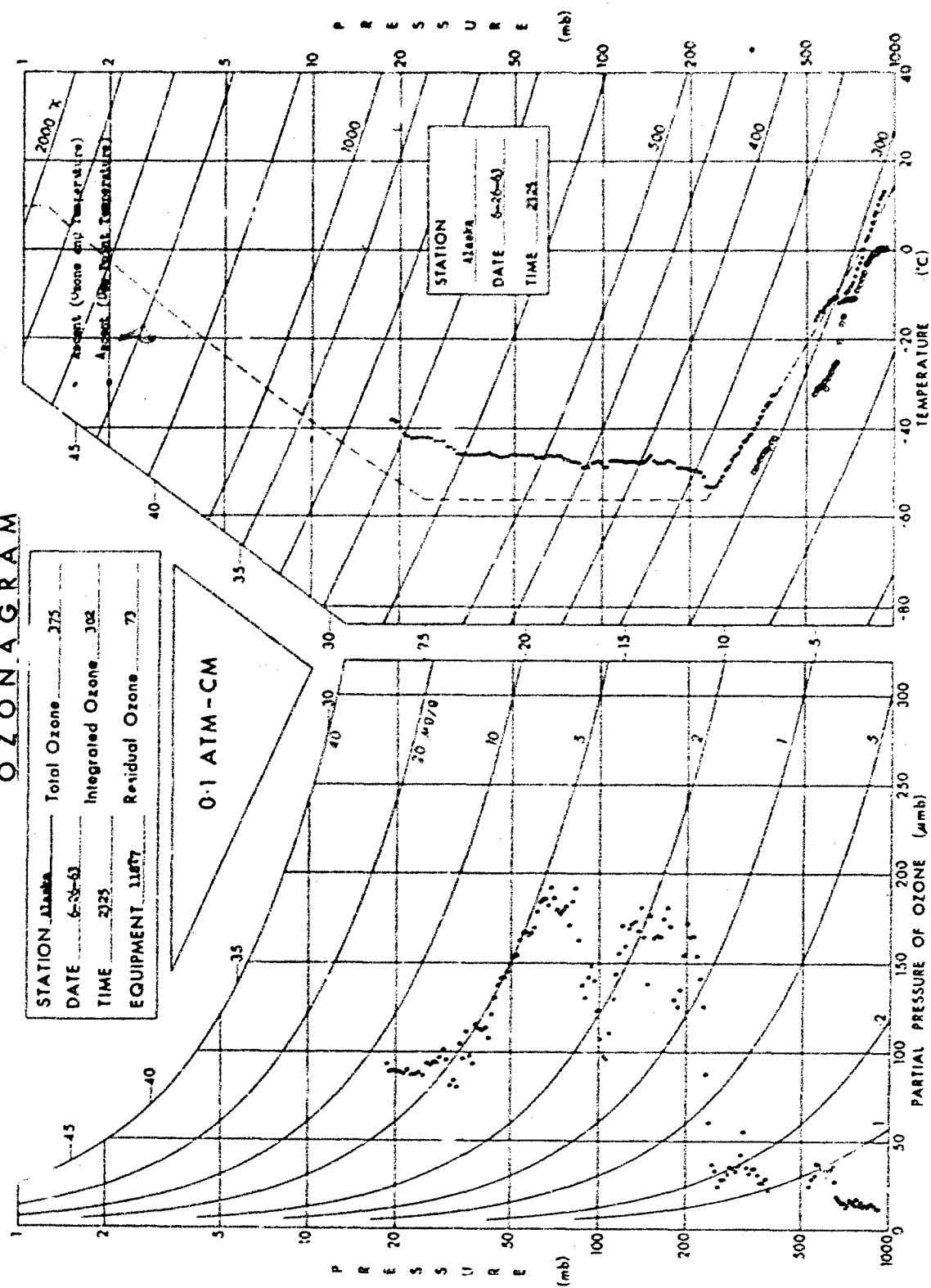


## O Z O N A G R A M

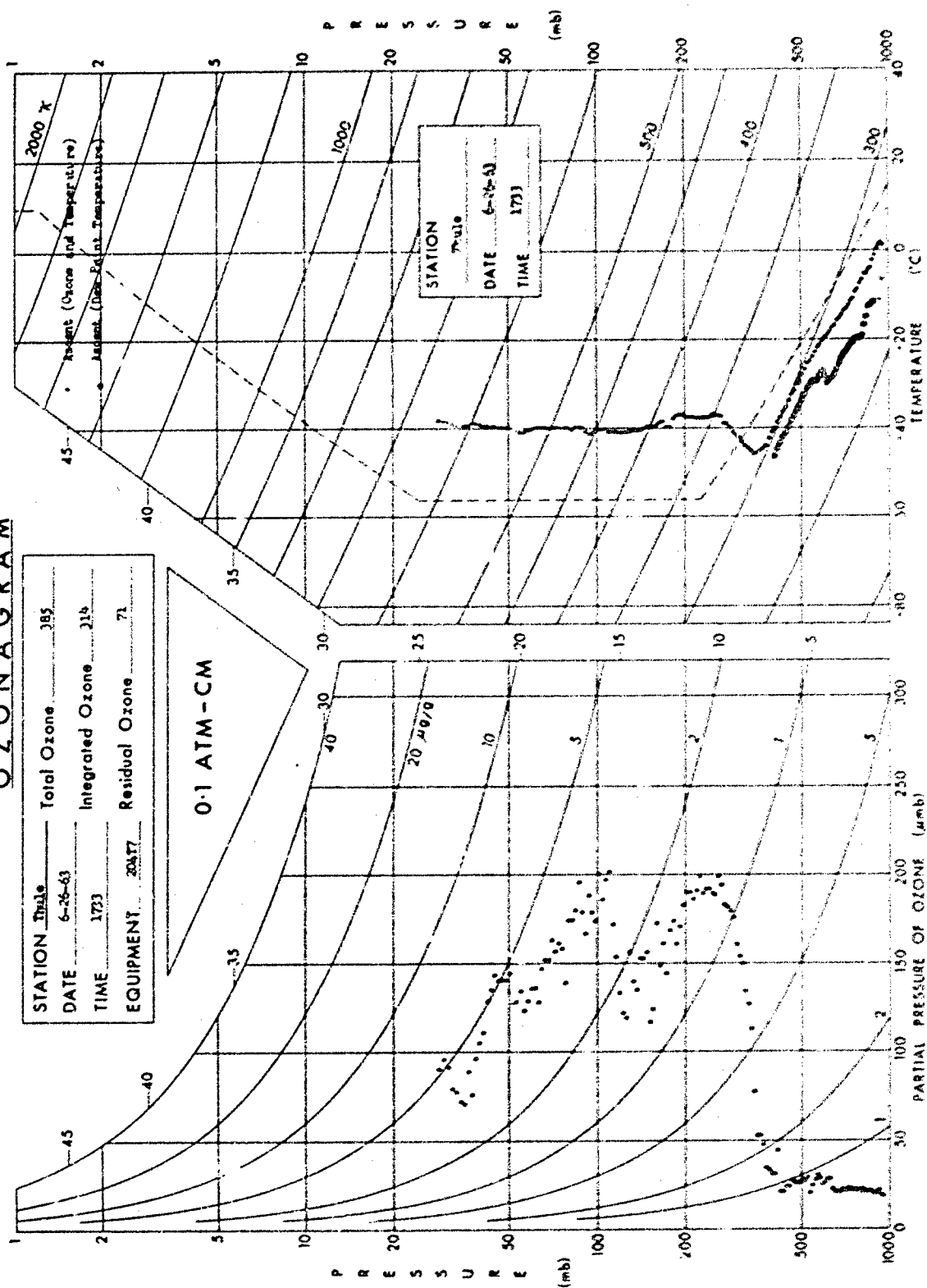




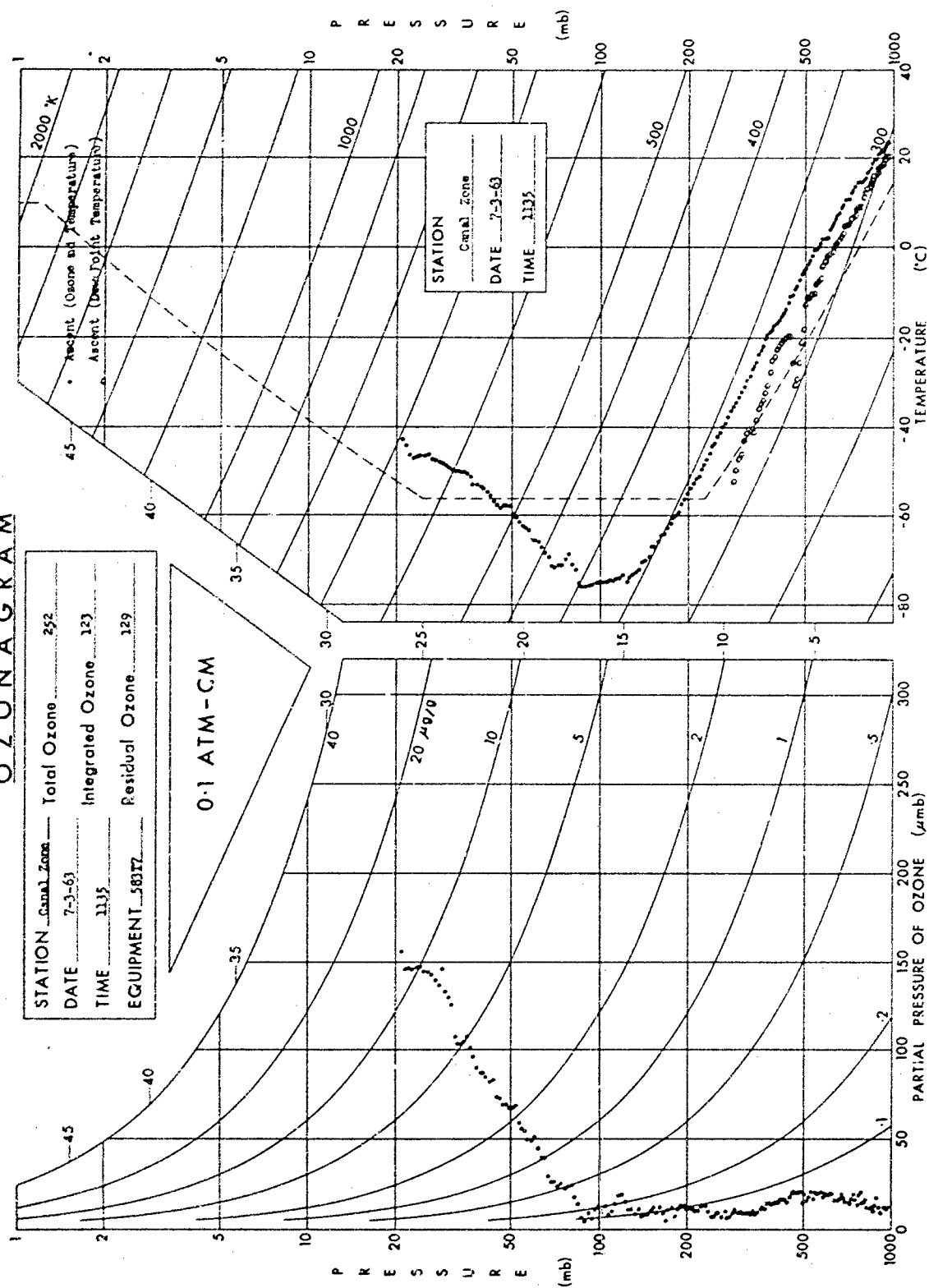
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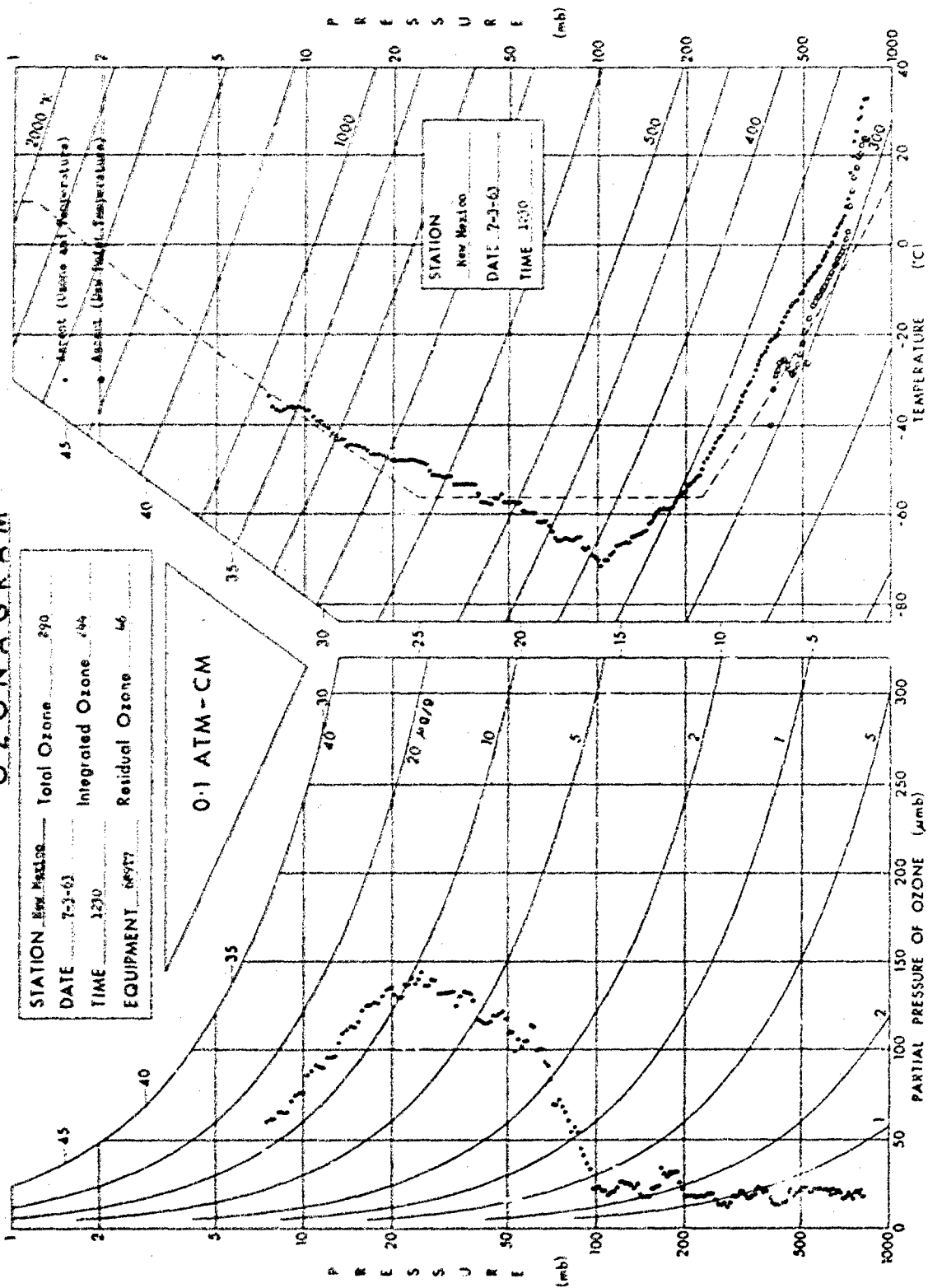
## OZONAGRAM



## OZONAGRAM

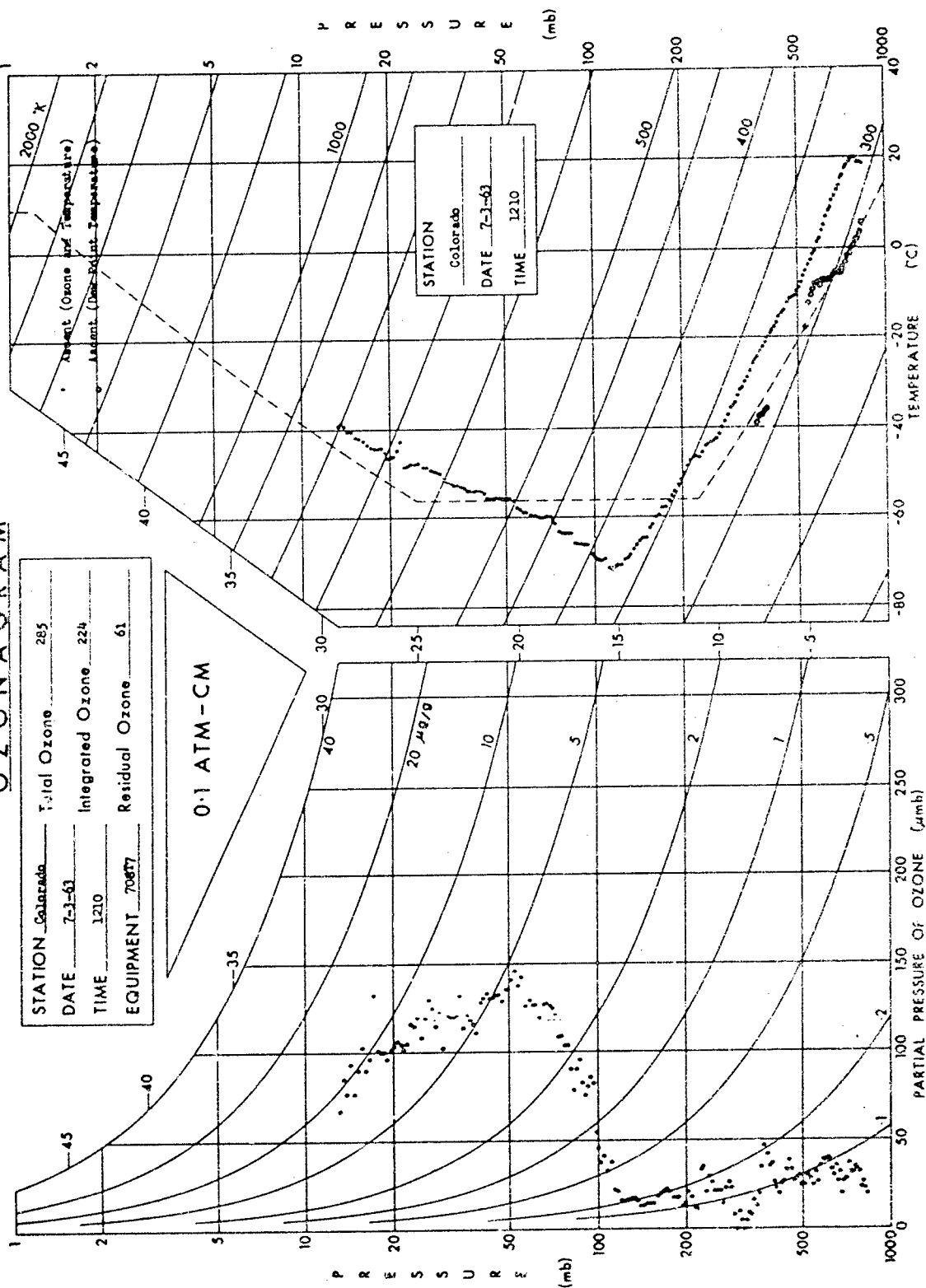


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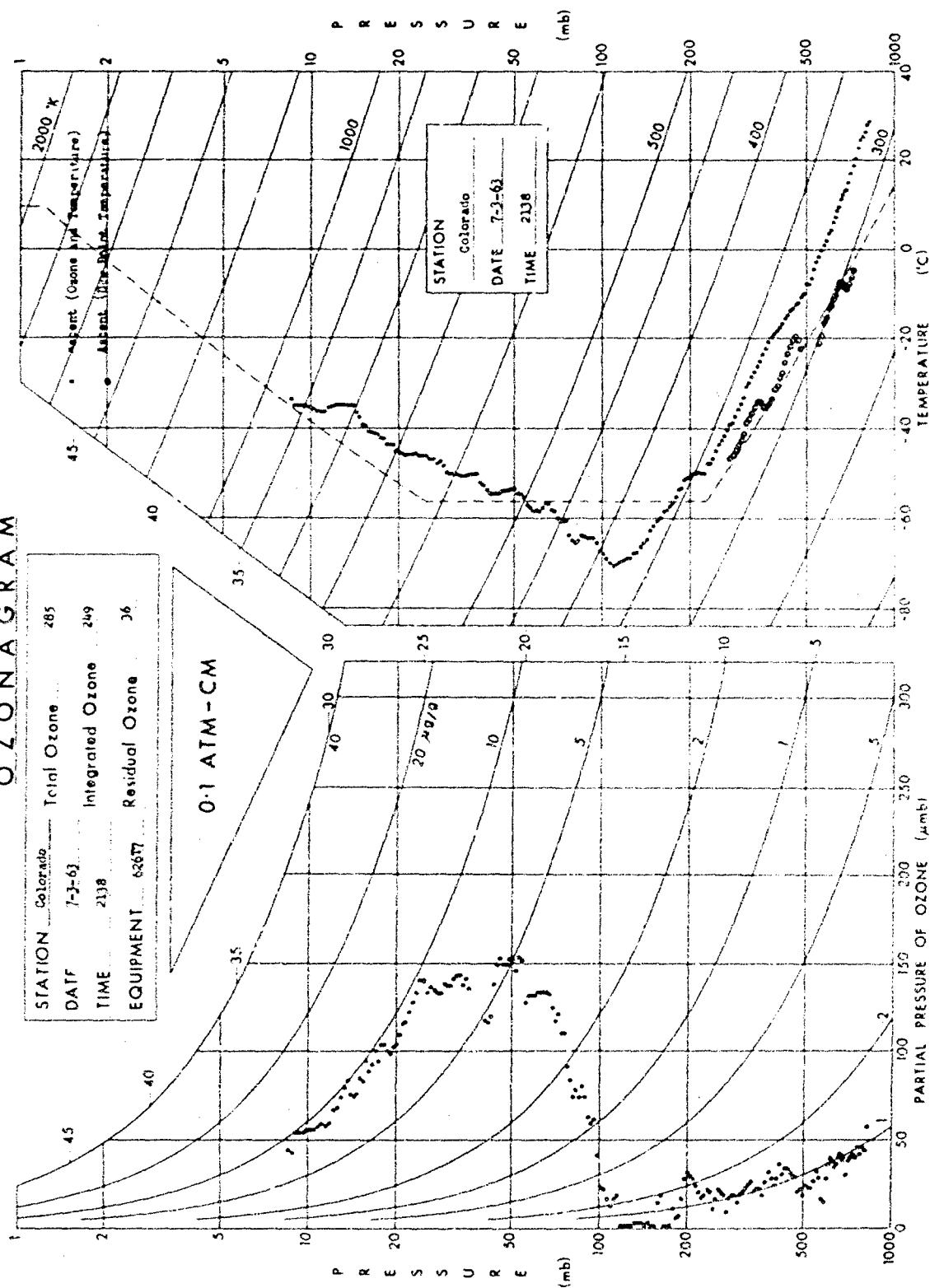




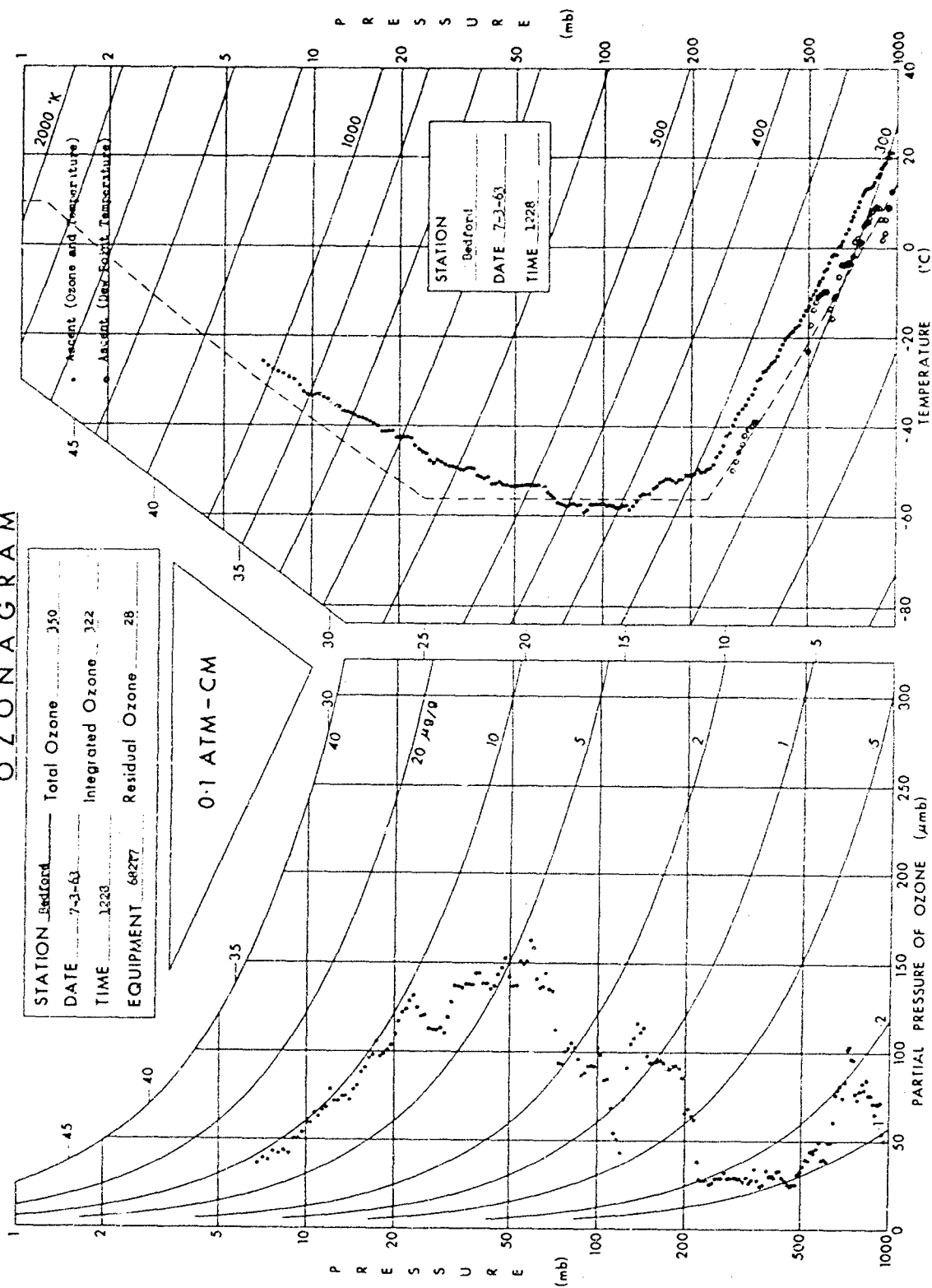
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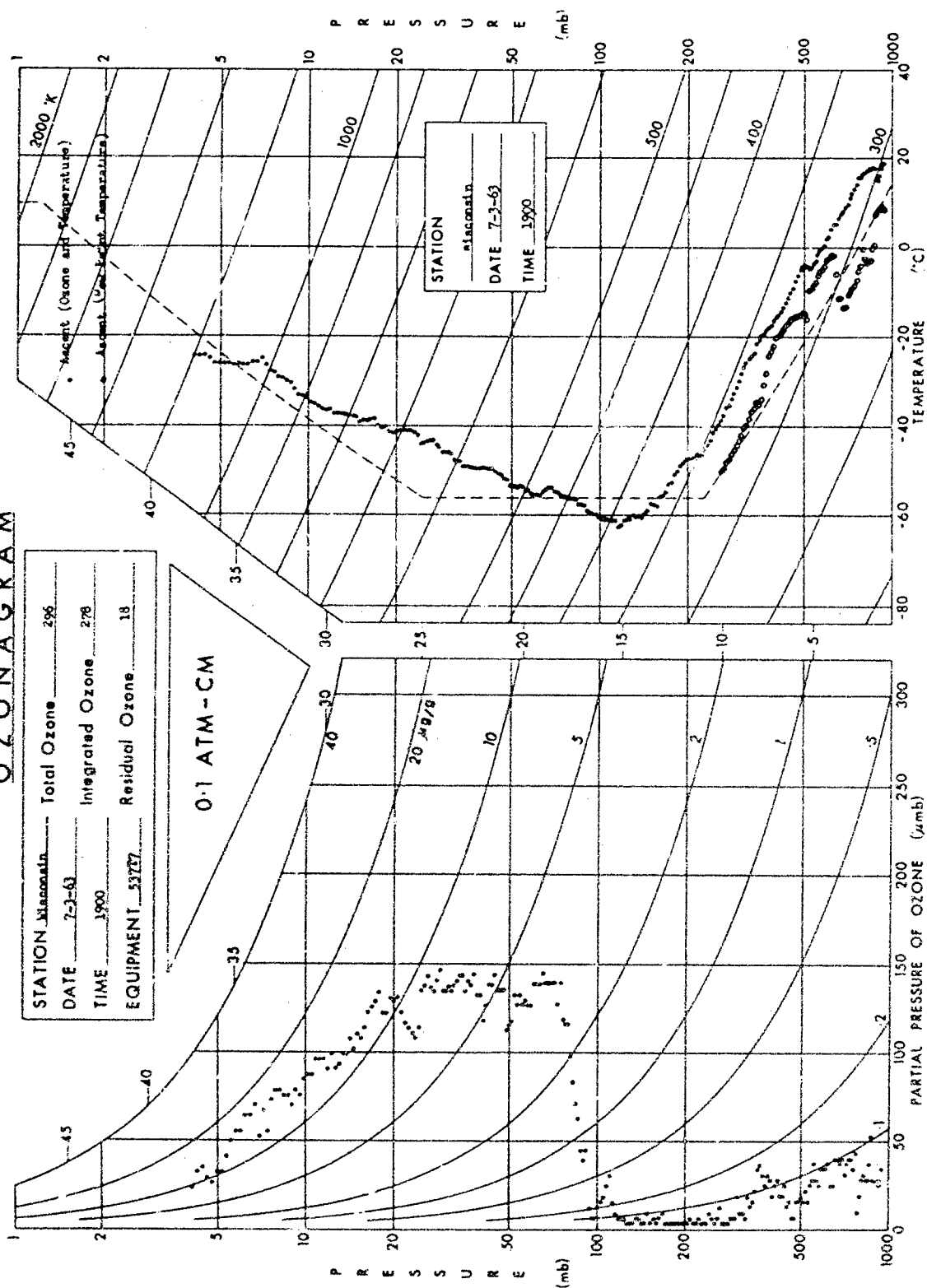
## OZONAGRAM



## OZONAGRAM



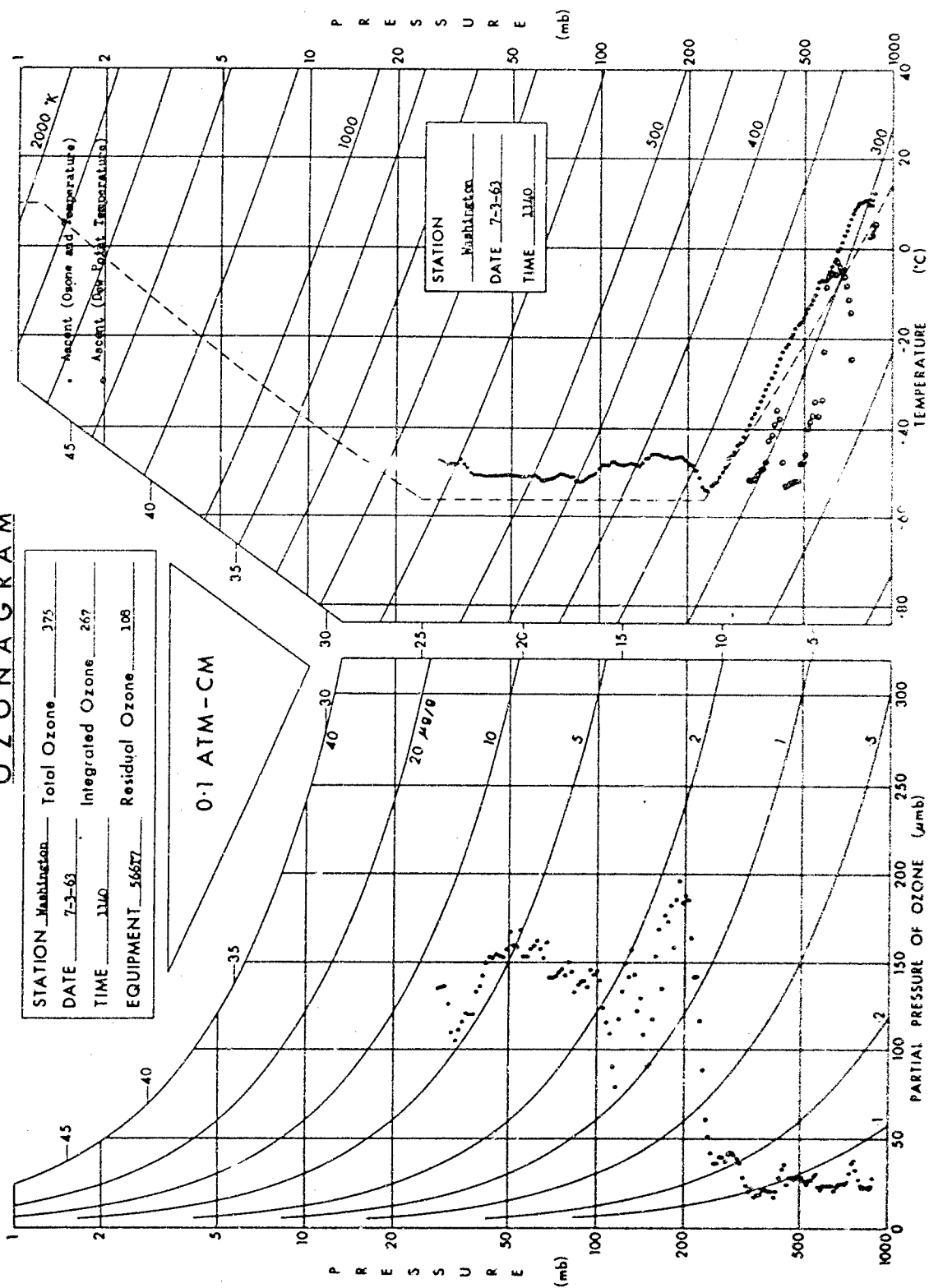
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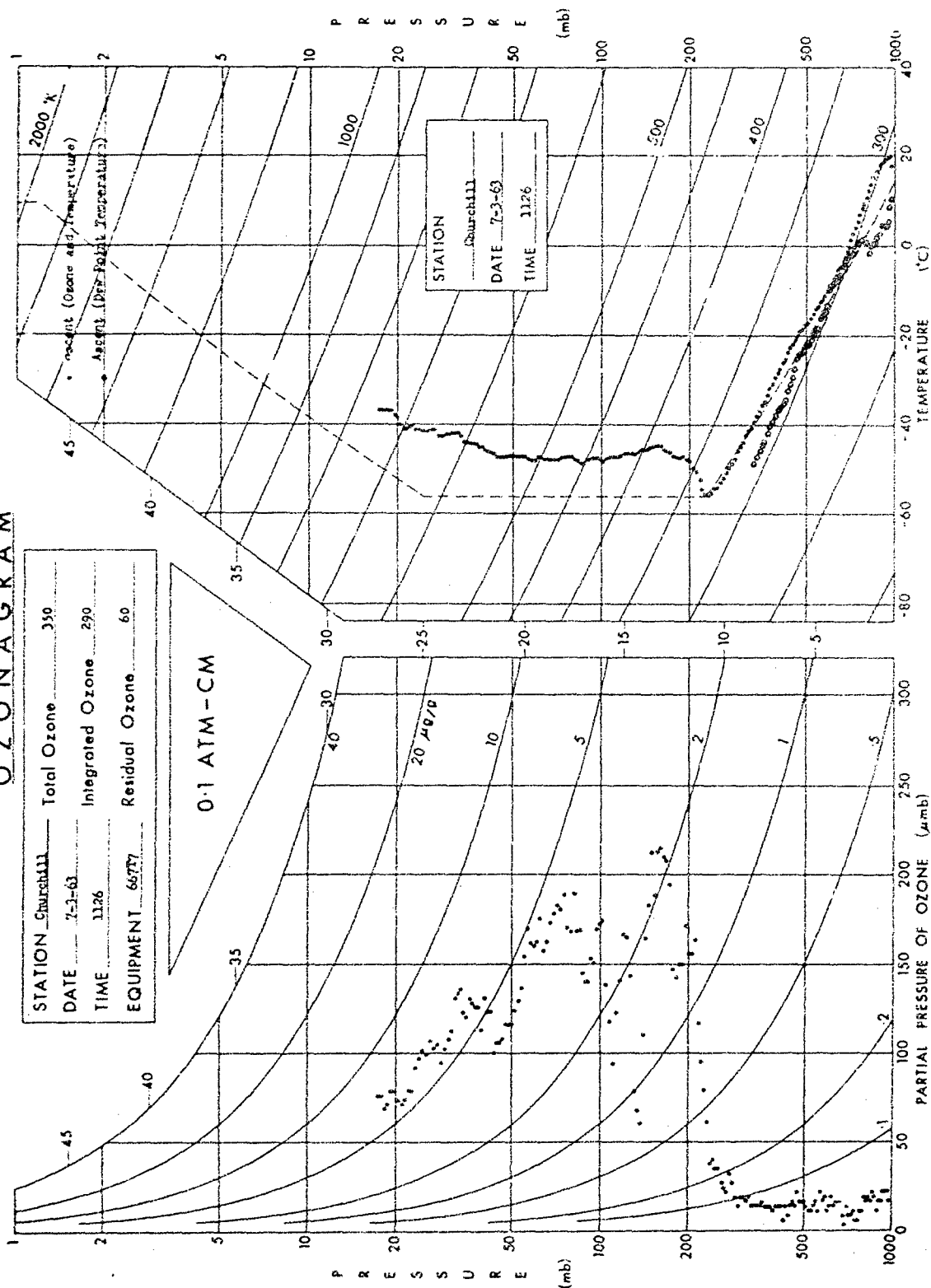
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STATION Washington Total Ozone 375  
 DATE 7-3-63 Integrated Ozone 267  
 TIME 1140 Residual Ozone 108  
 EQUIPMENT 56677

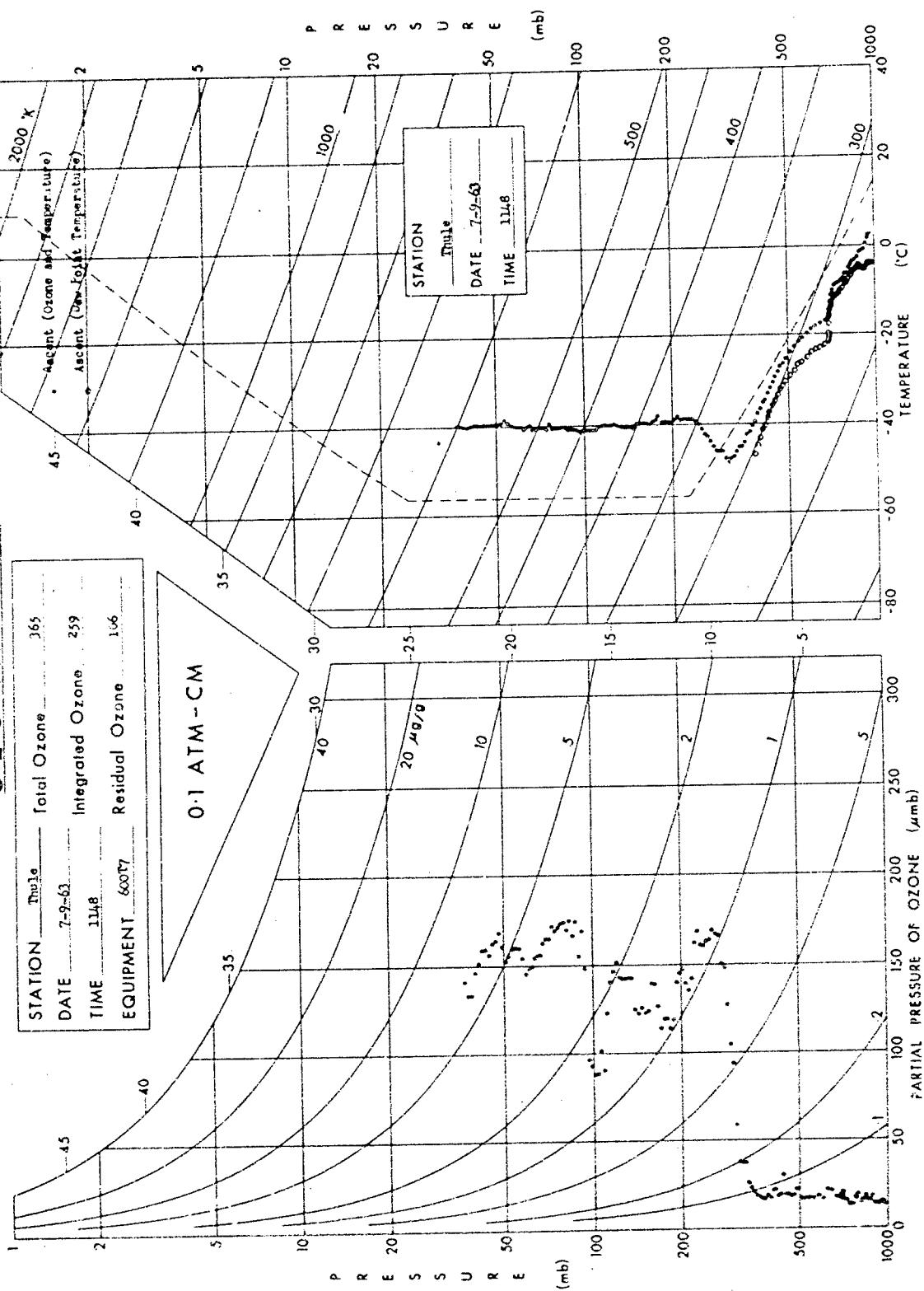
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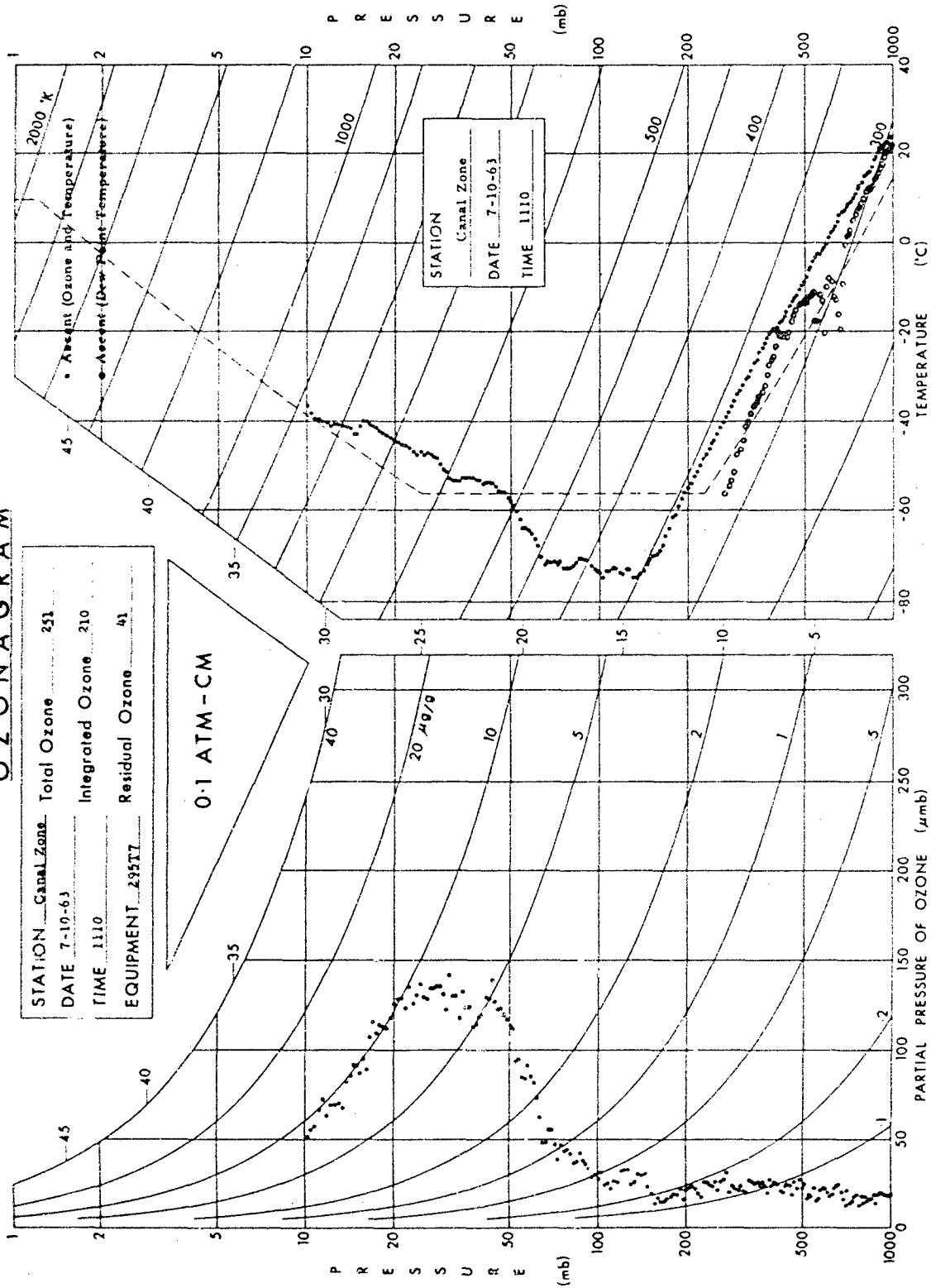
## O Z O N A G R A M



## OZONAGRAM

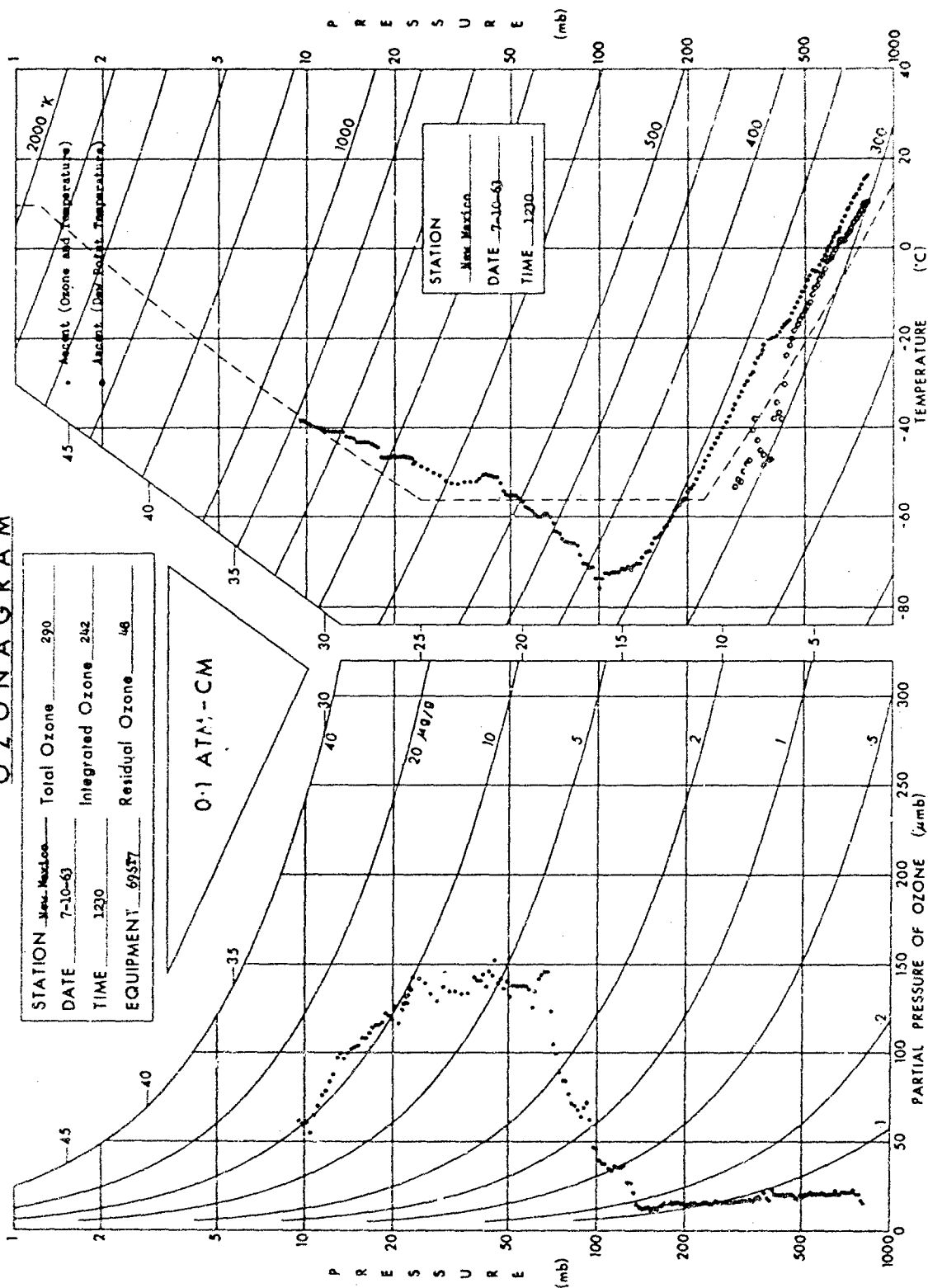


## O Z O N A G R A M





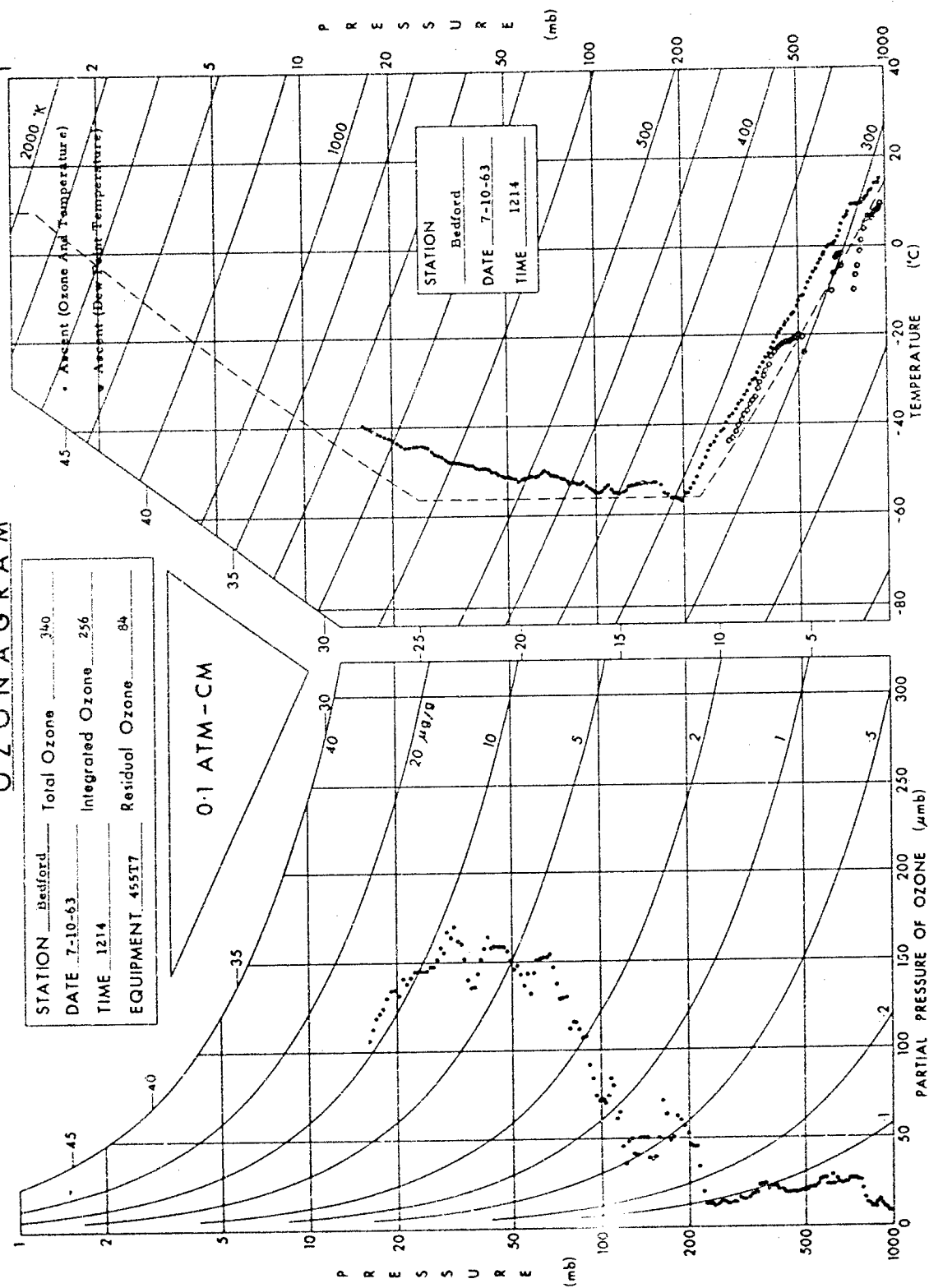
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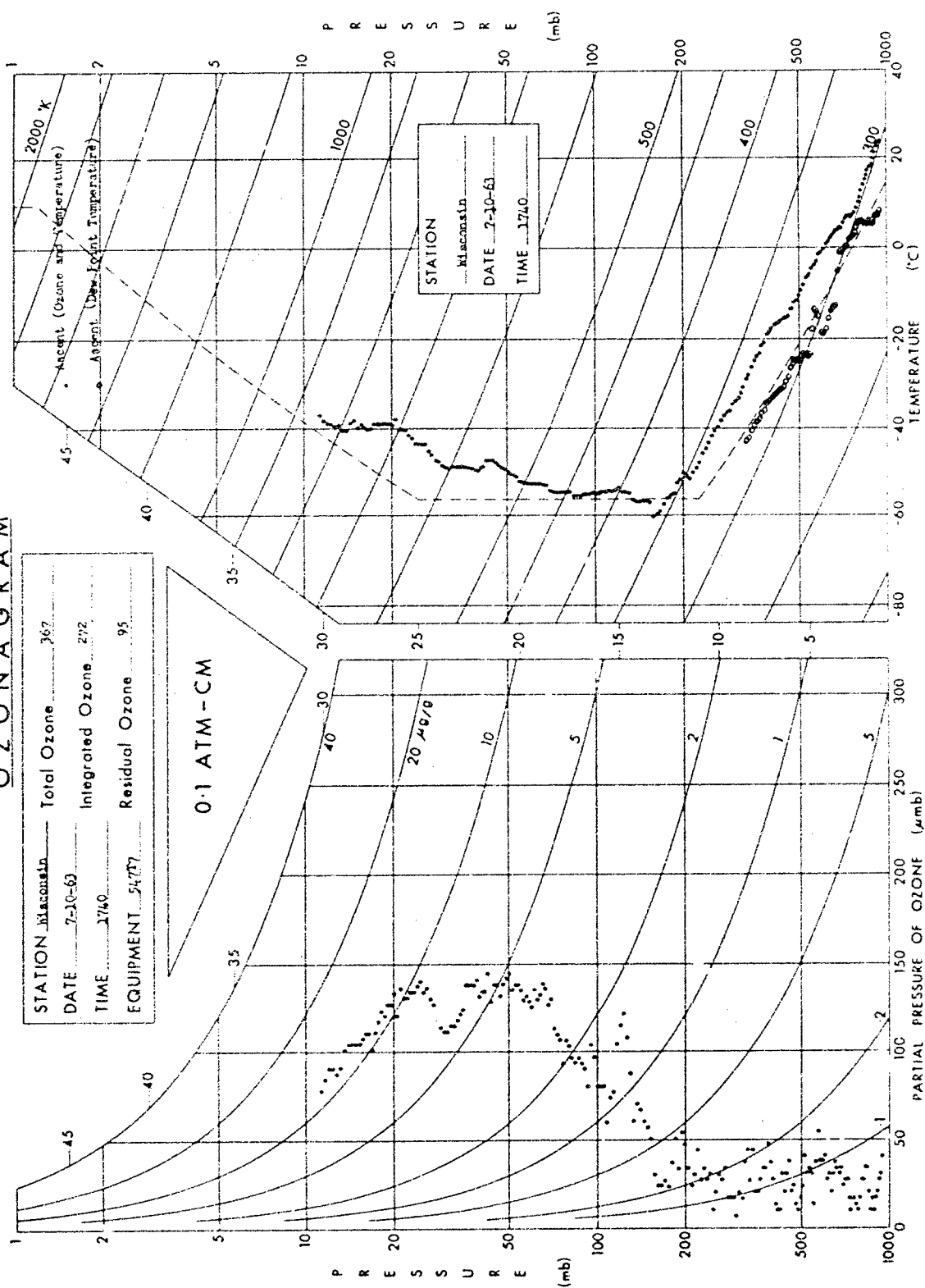
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STATION	Bedford	Total Ozone	340
DATE	7-10-63	Integrated Ozone	256
TIME	1214	Residual Ozone	84
EQUIPMENT	455T7		

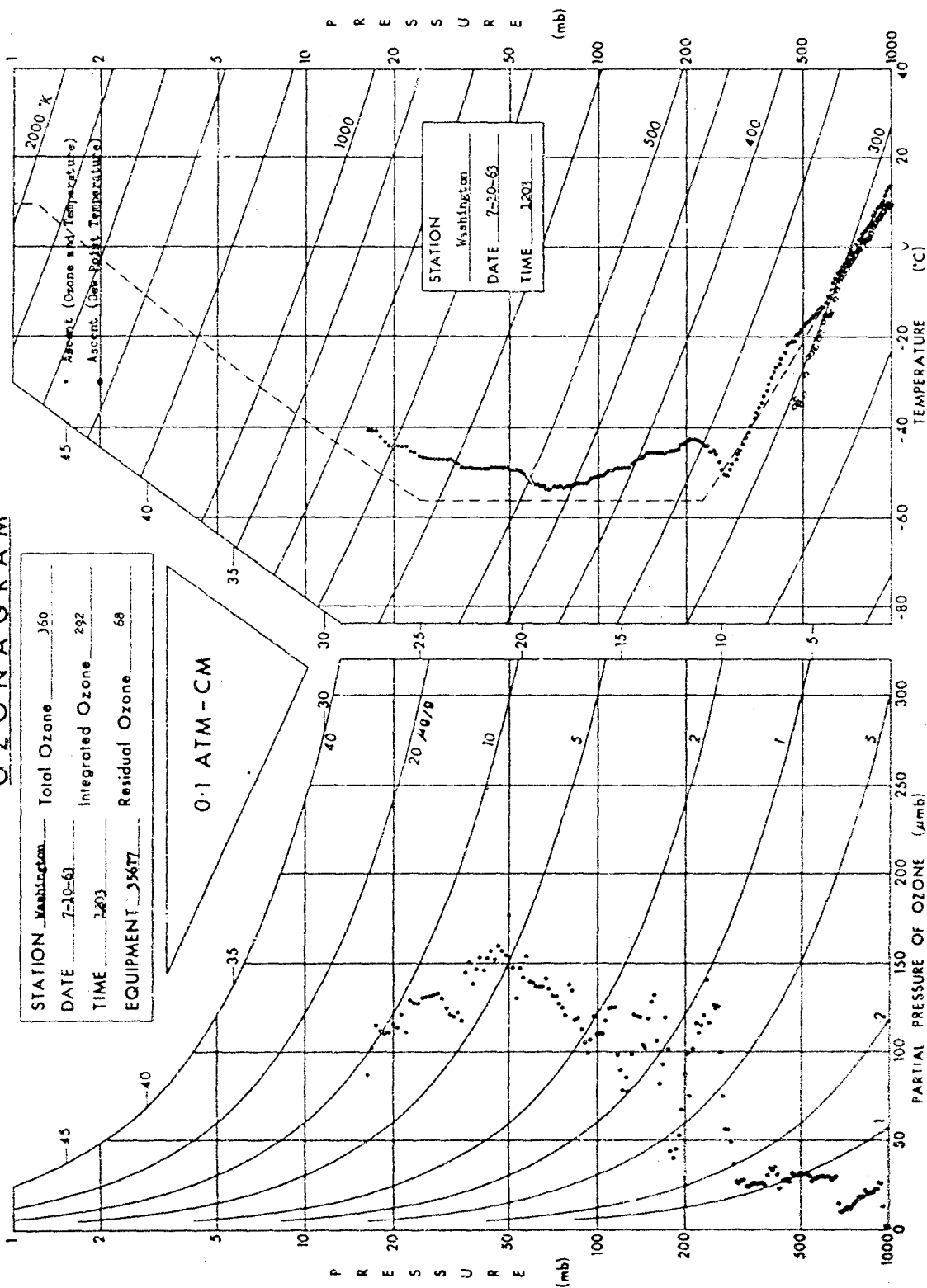
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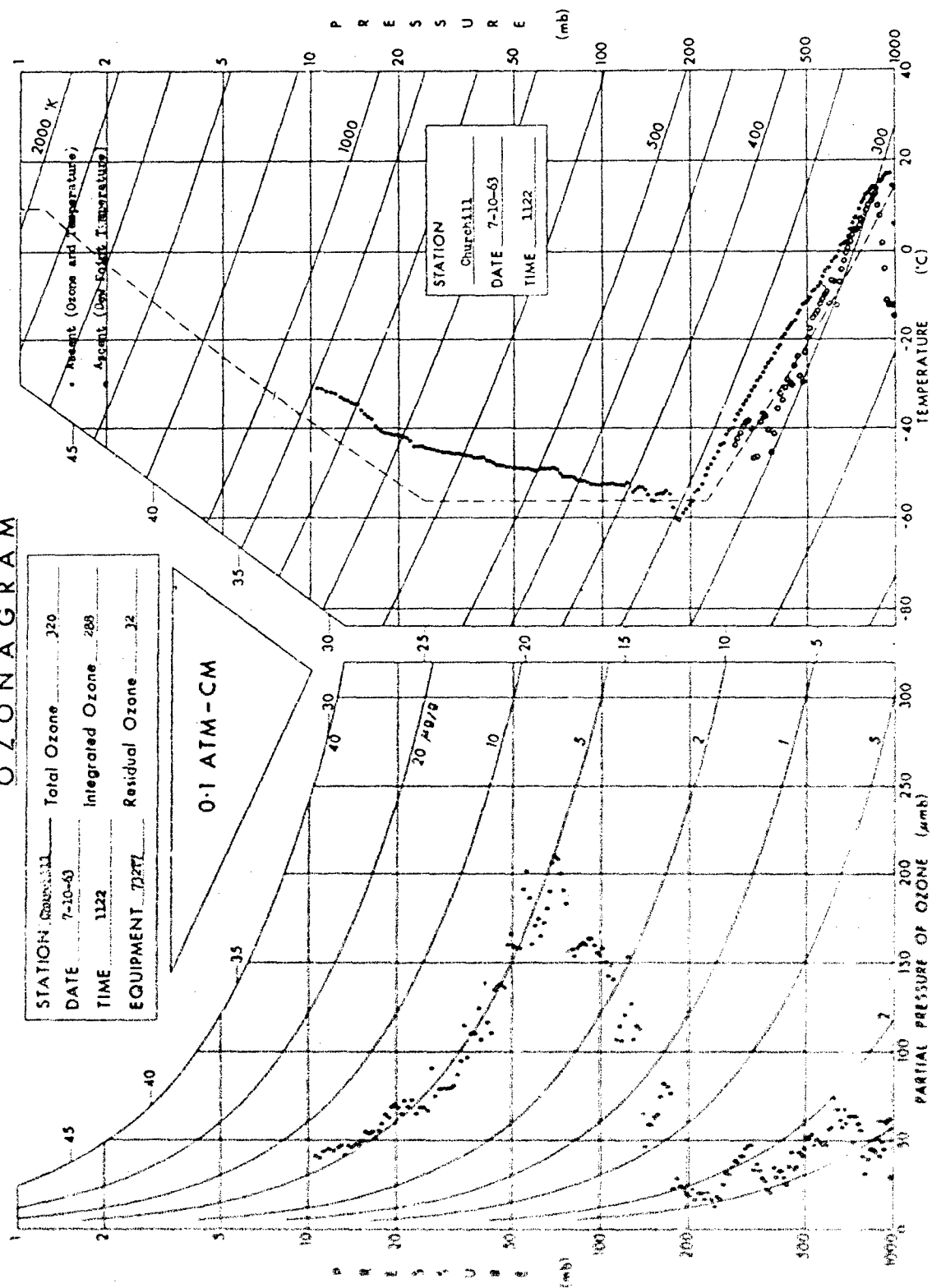
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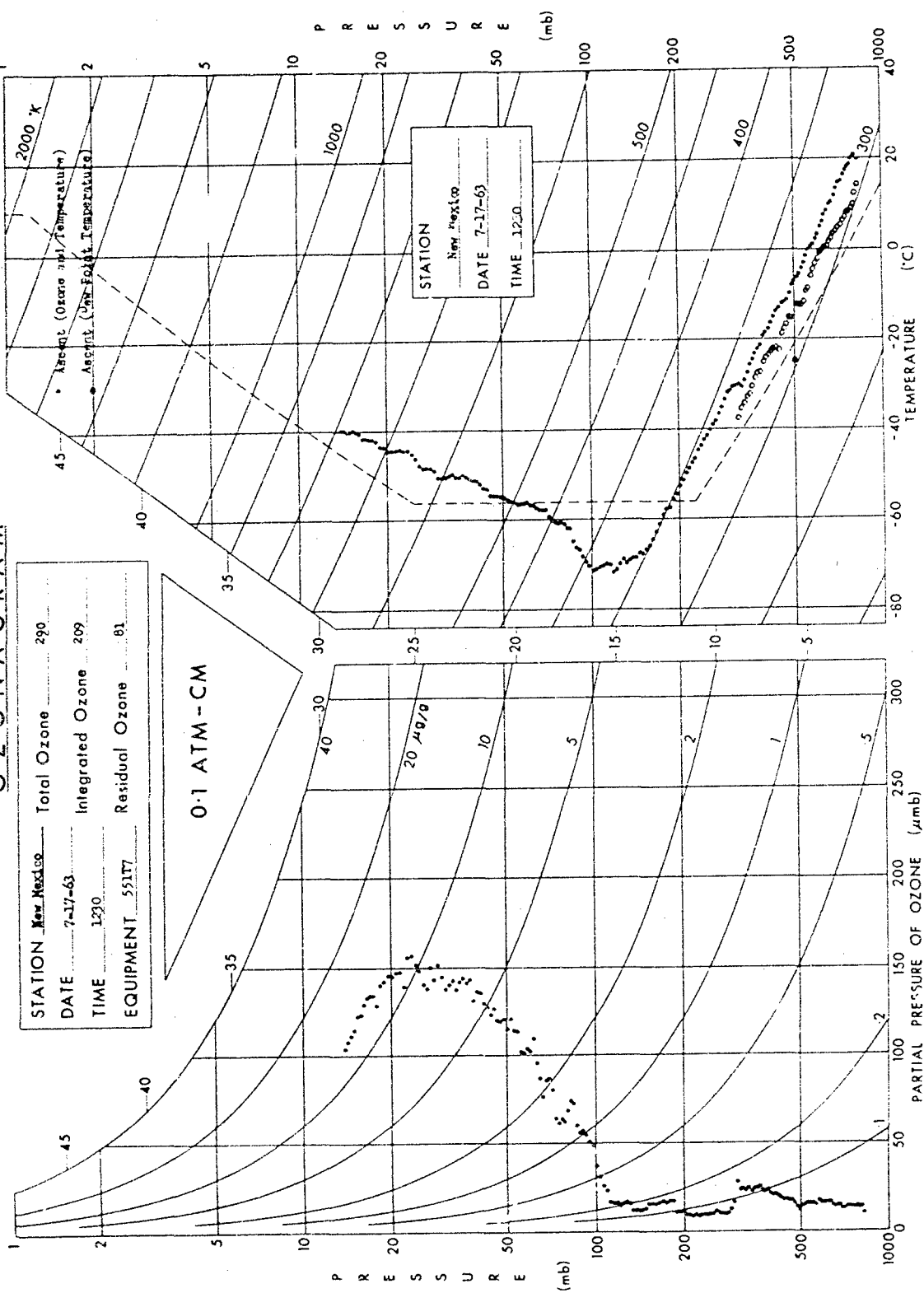
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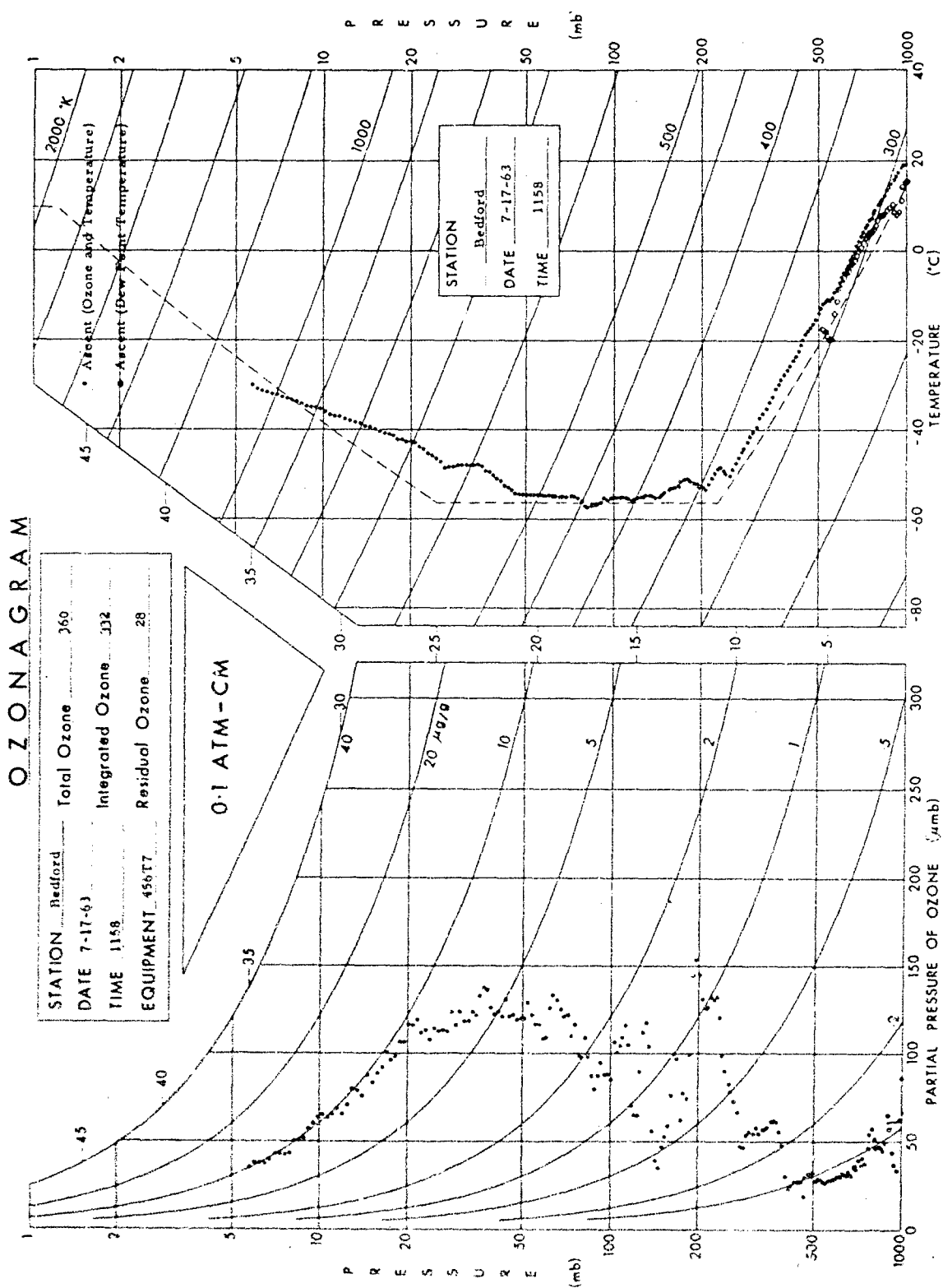


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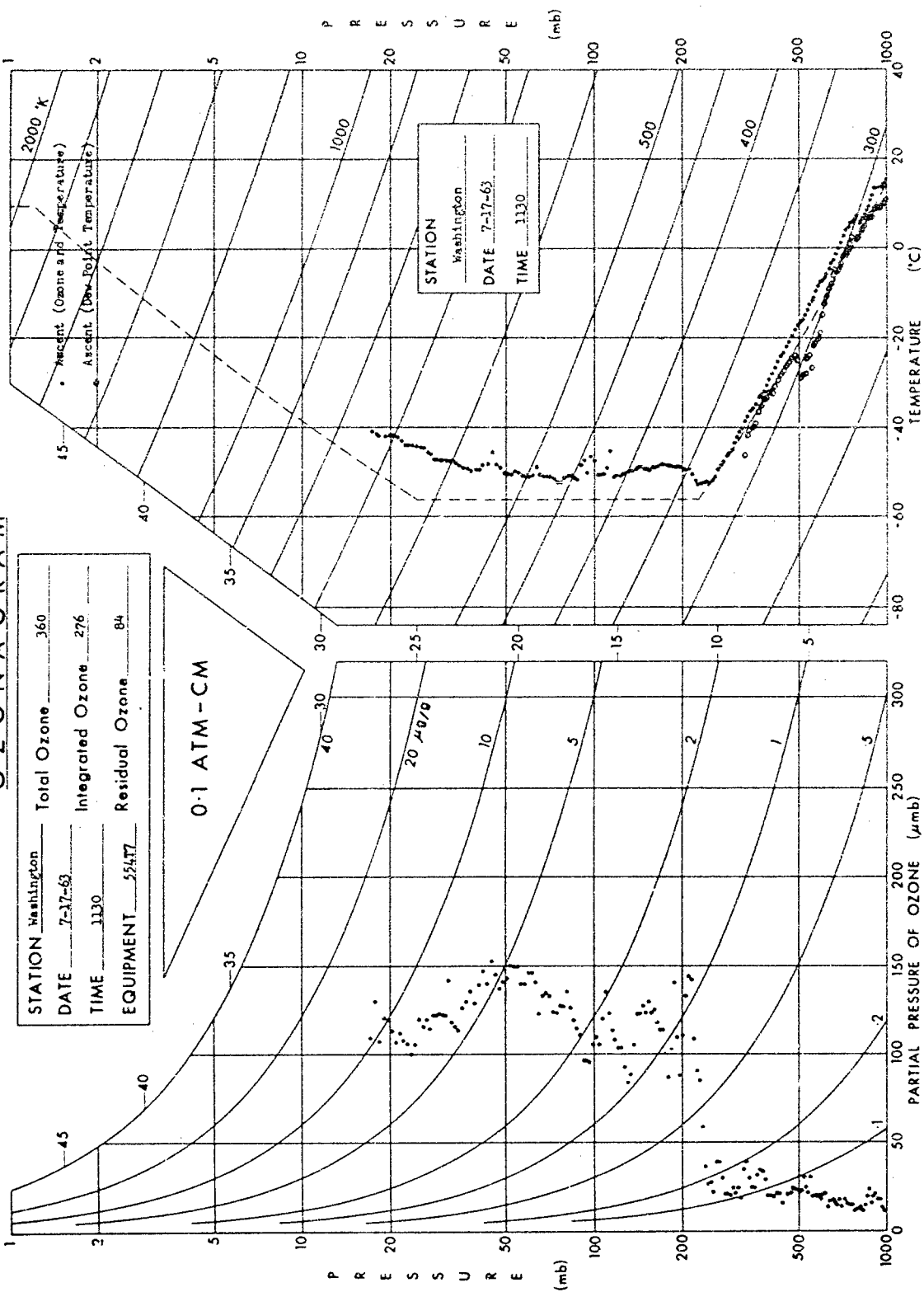


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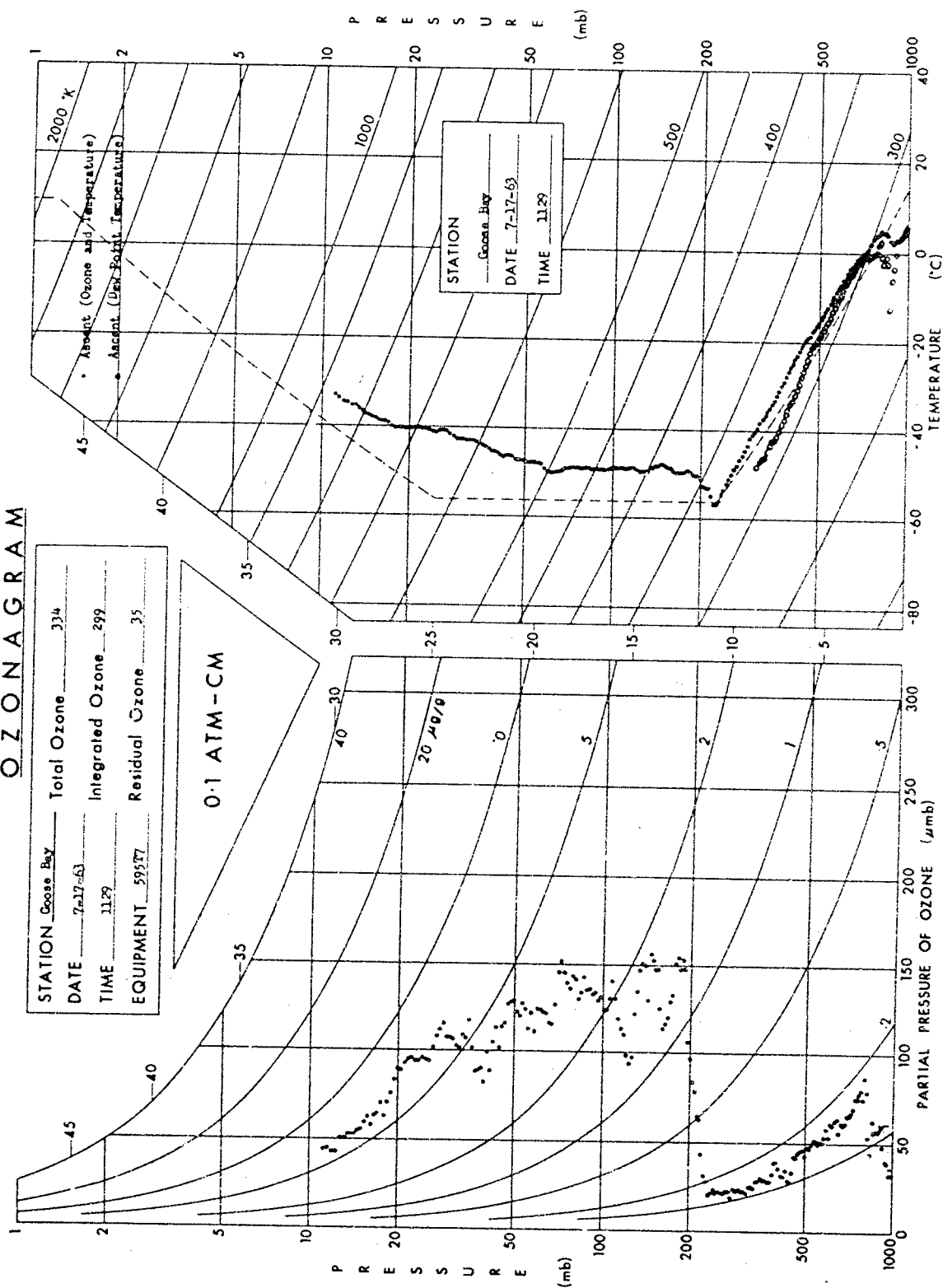


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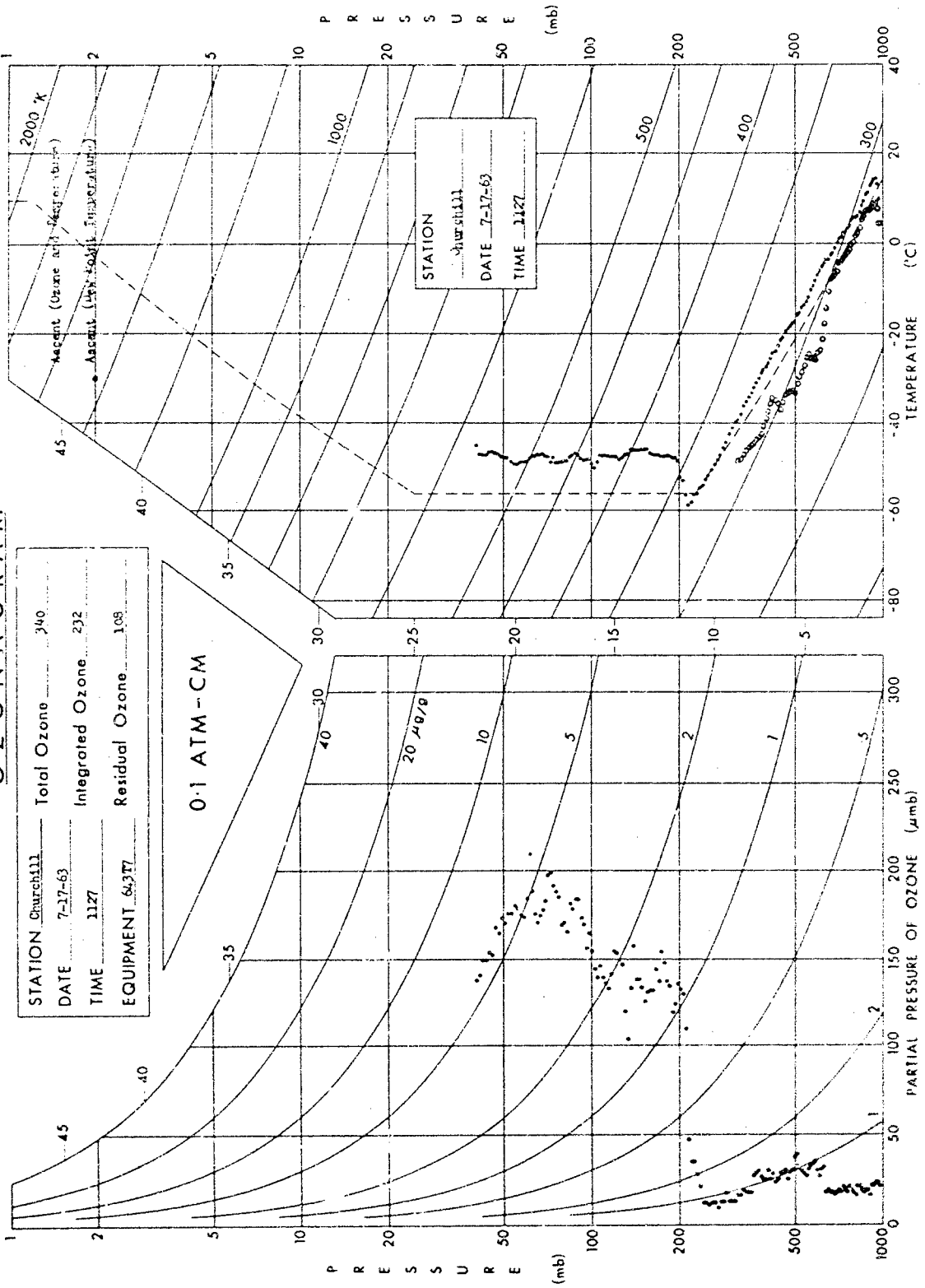




## O Z O N A G R A M



## O Z O N A G R A M

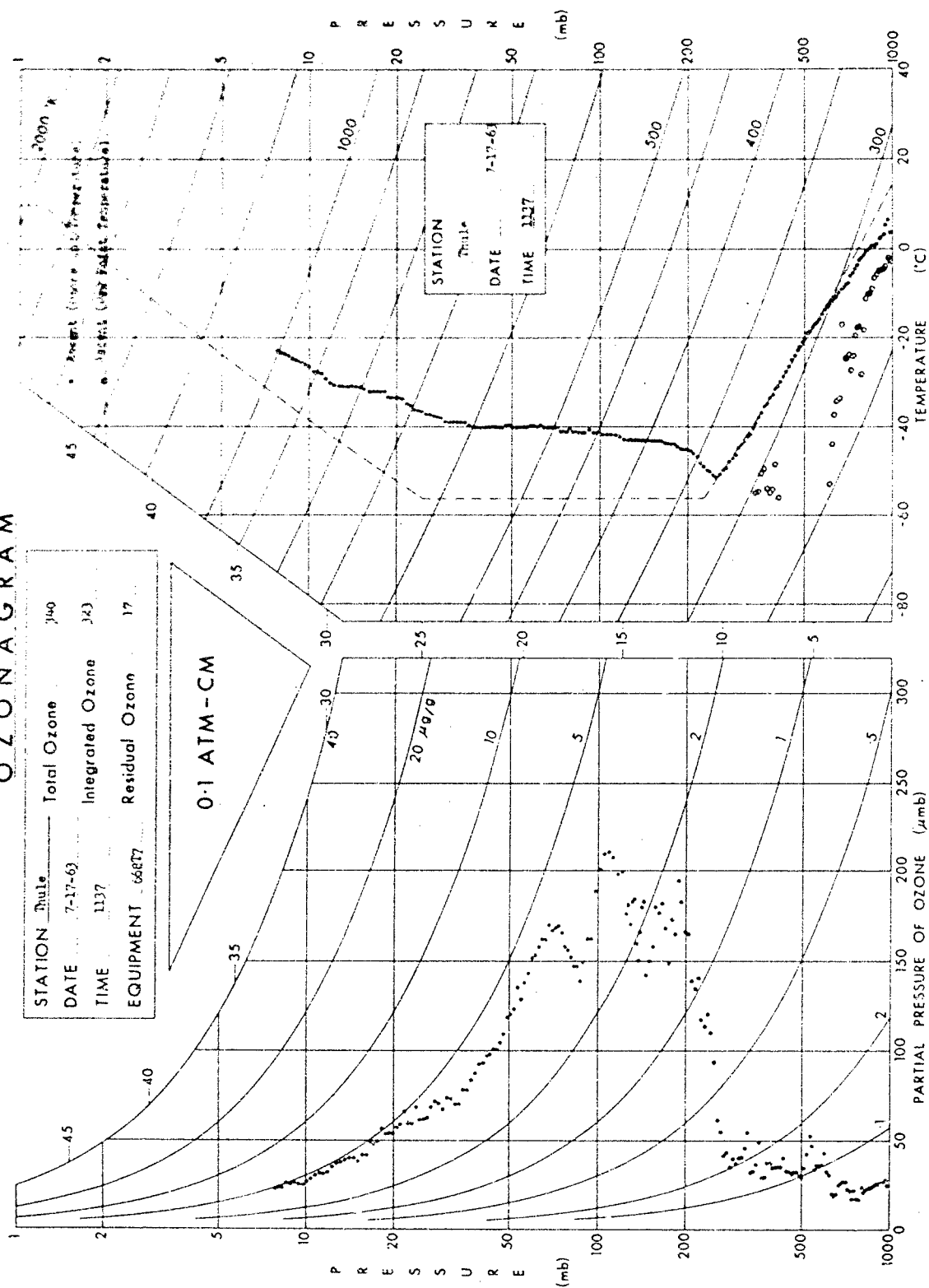


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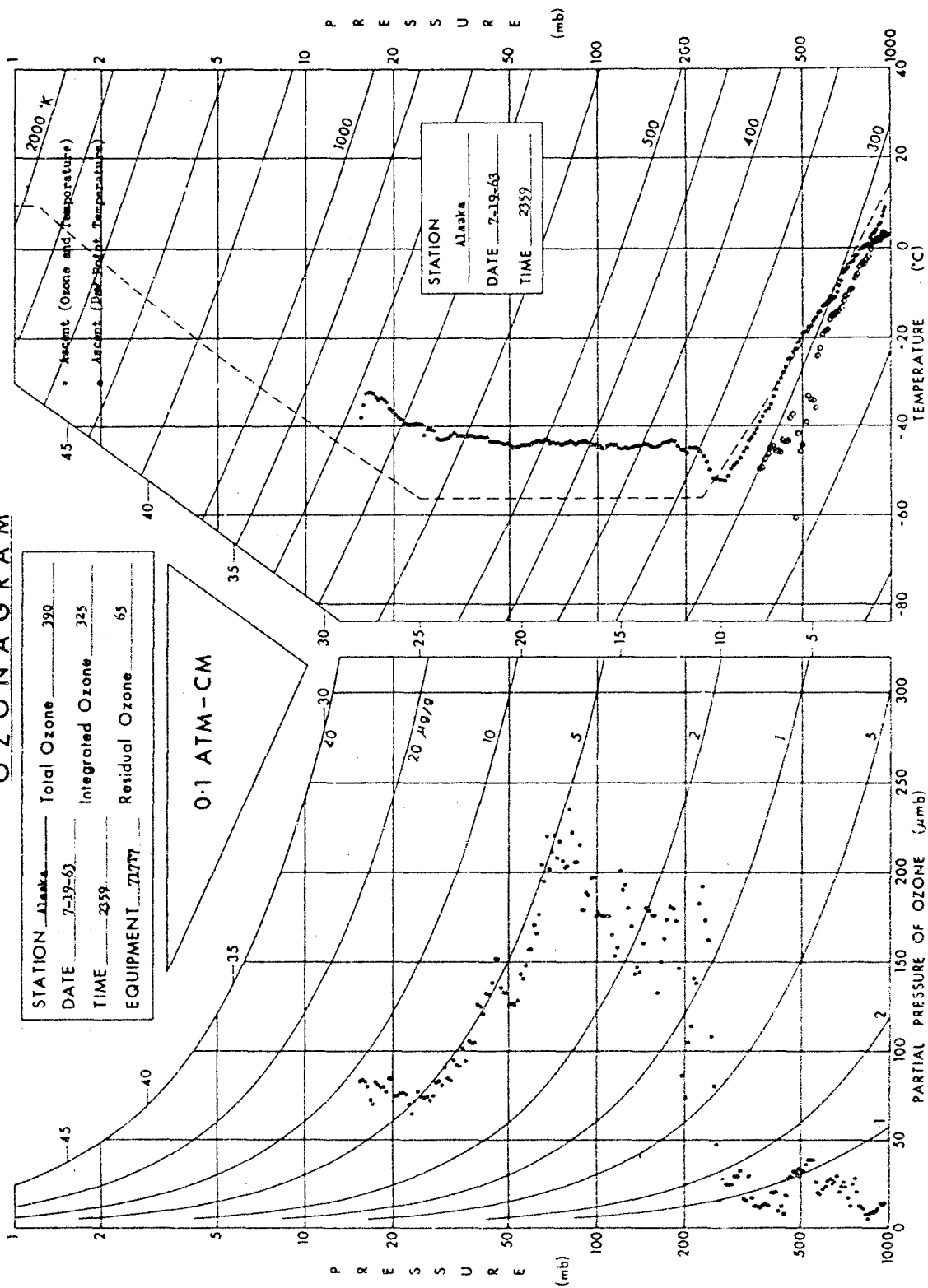
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 DATE 7-17-63  
 TIME 1137  
 EQUIPMENT 66877

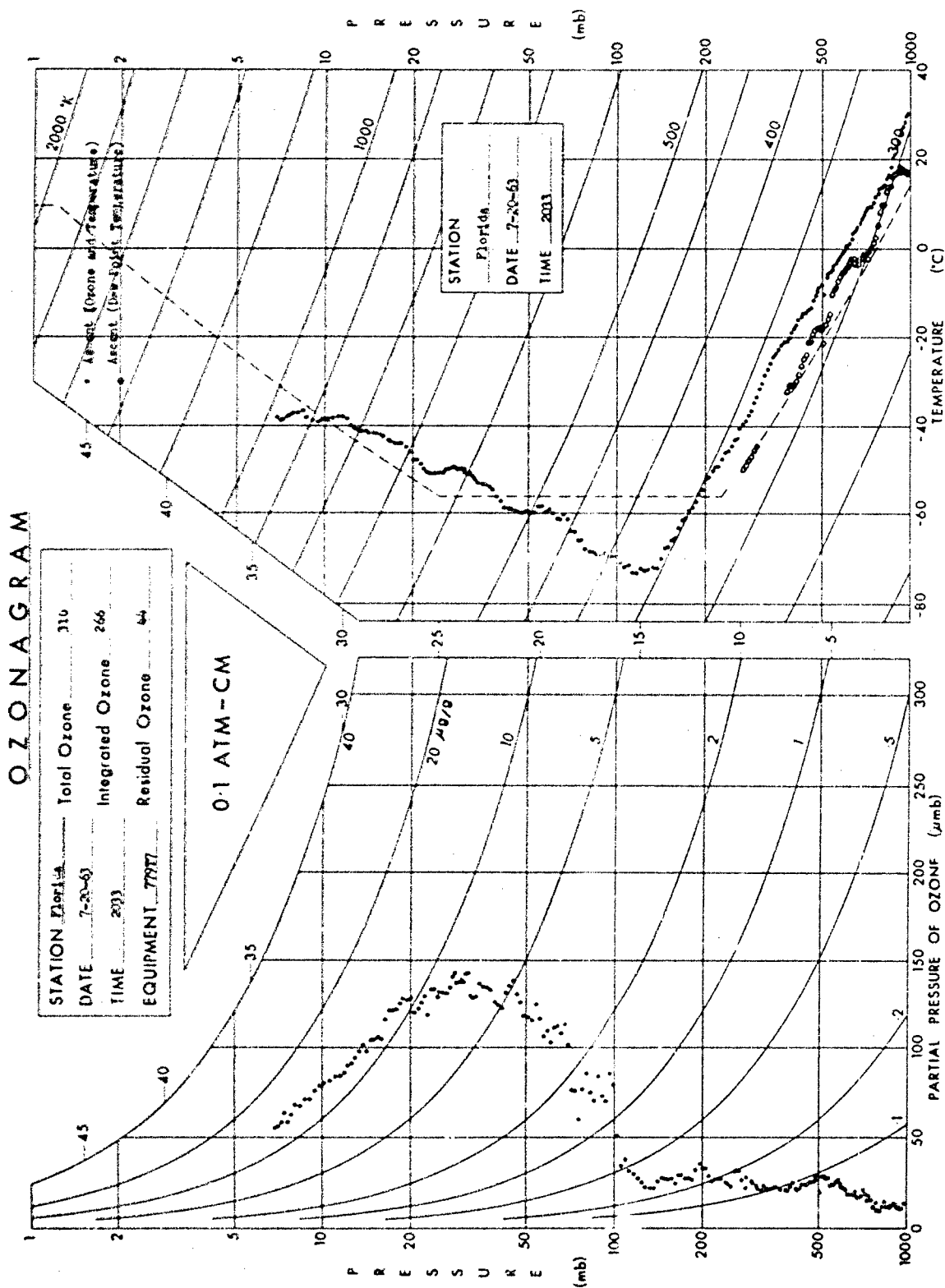
Total Ozone 340  
 Integrated Ozone 343  
 Residual Ozone 17

0.1 ATM-CM

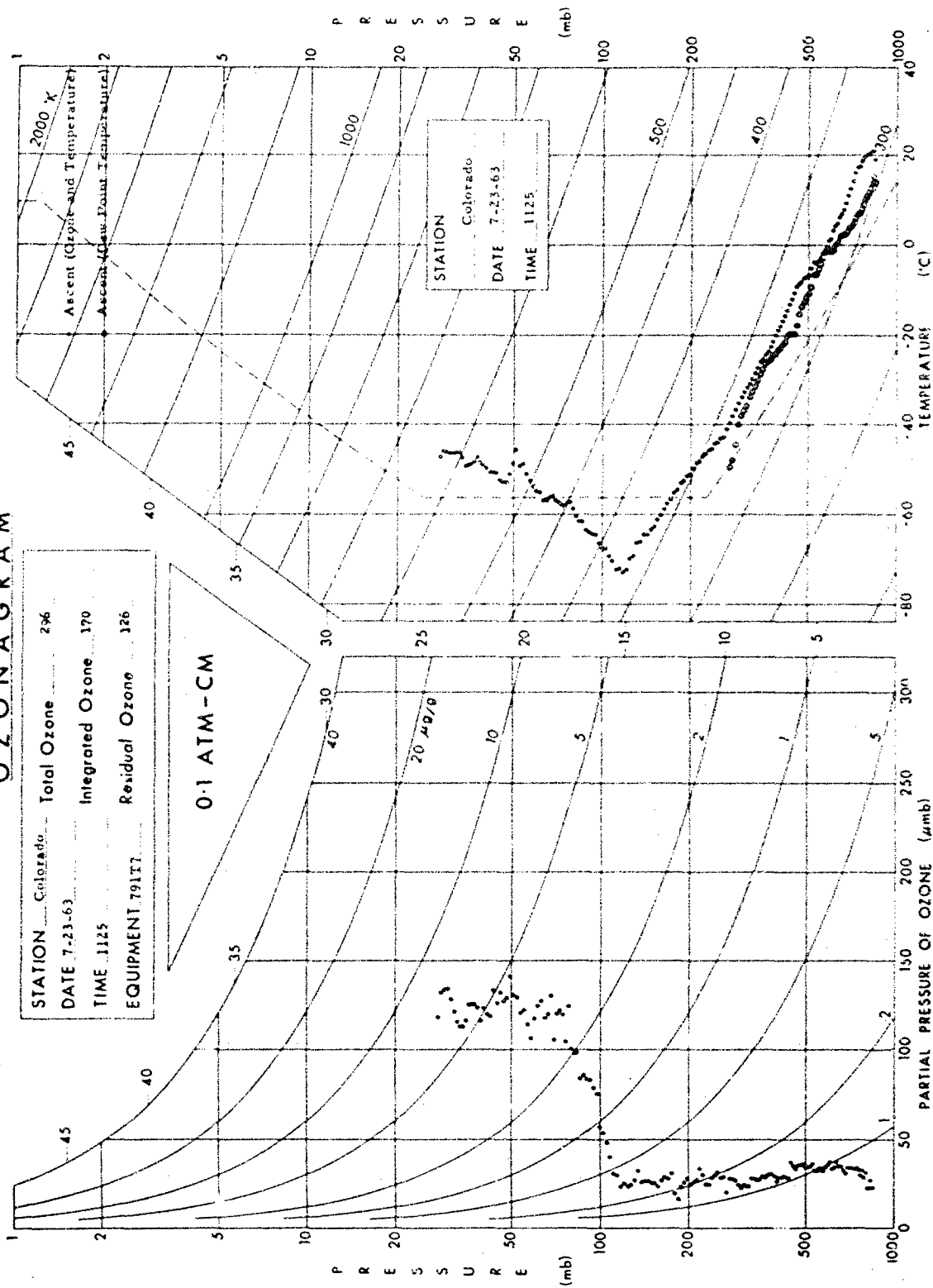


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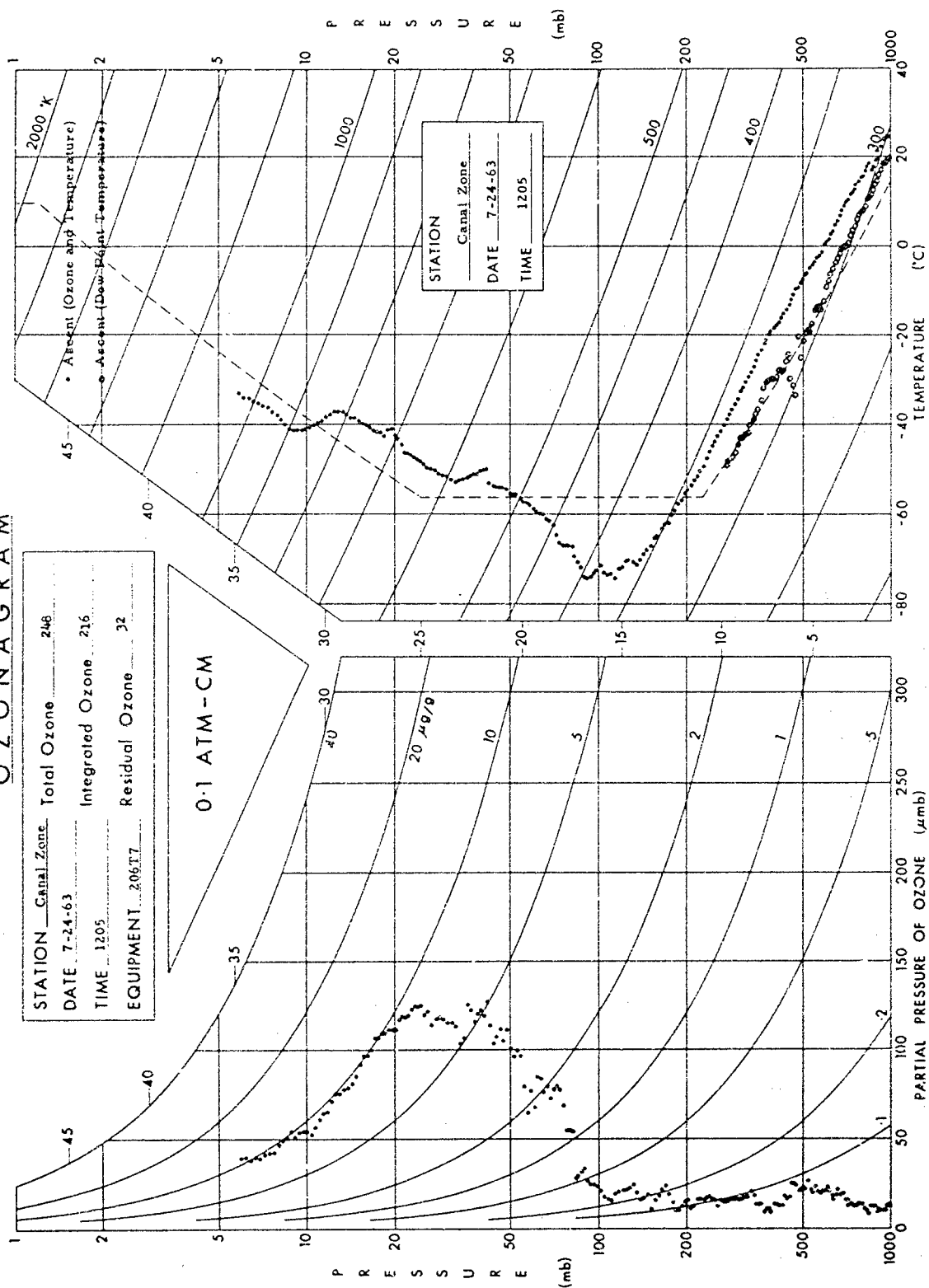


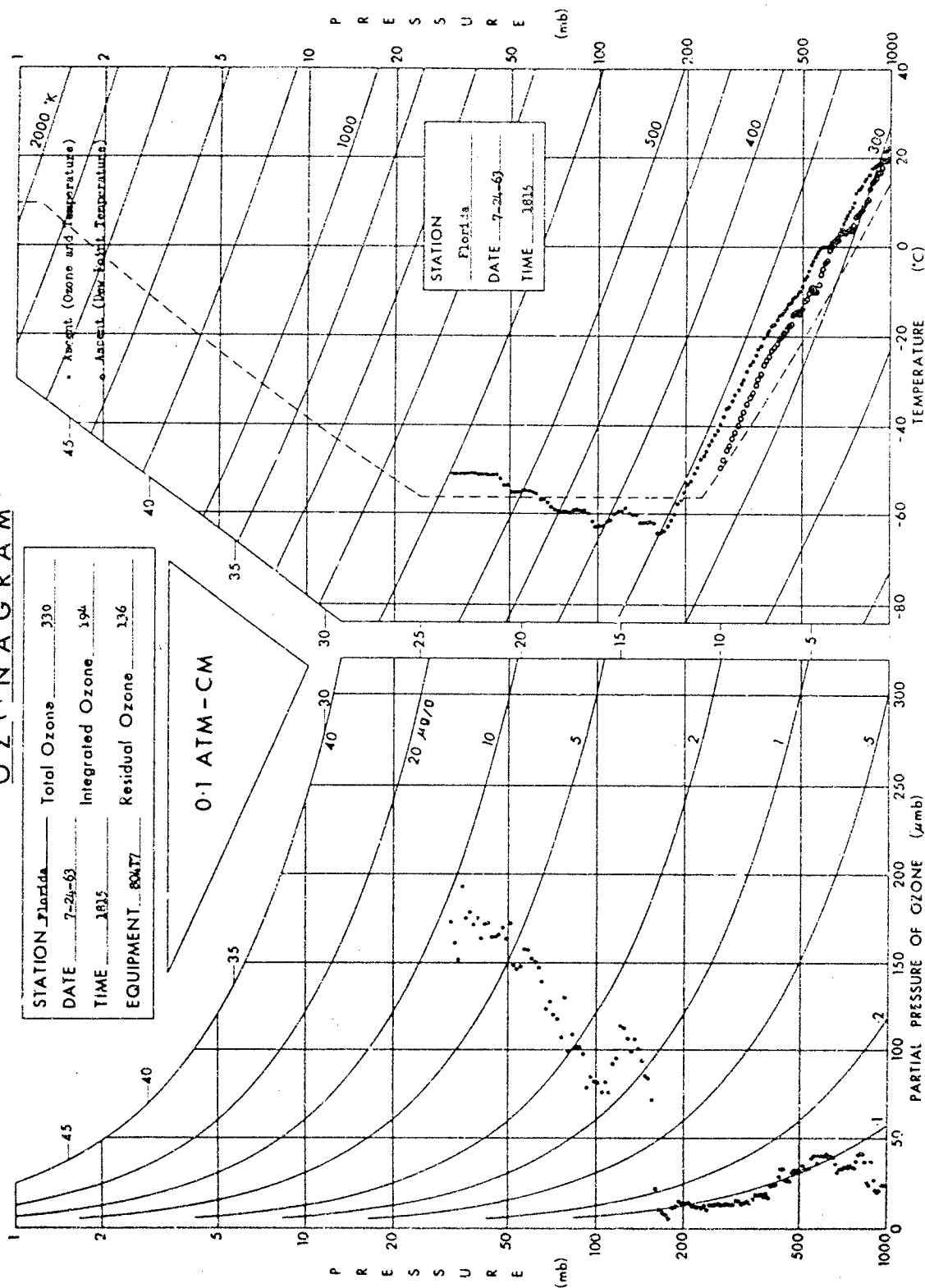


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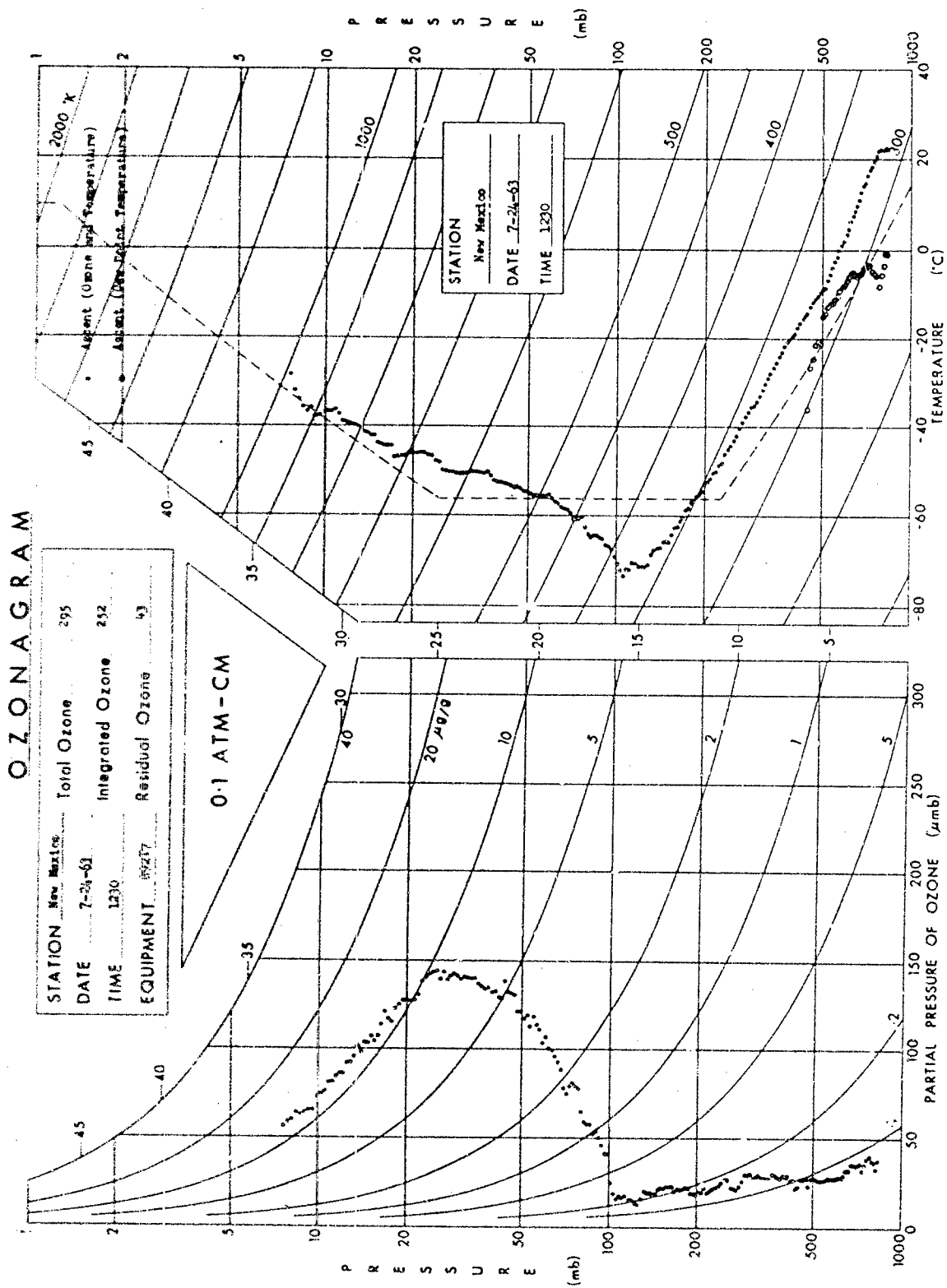


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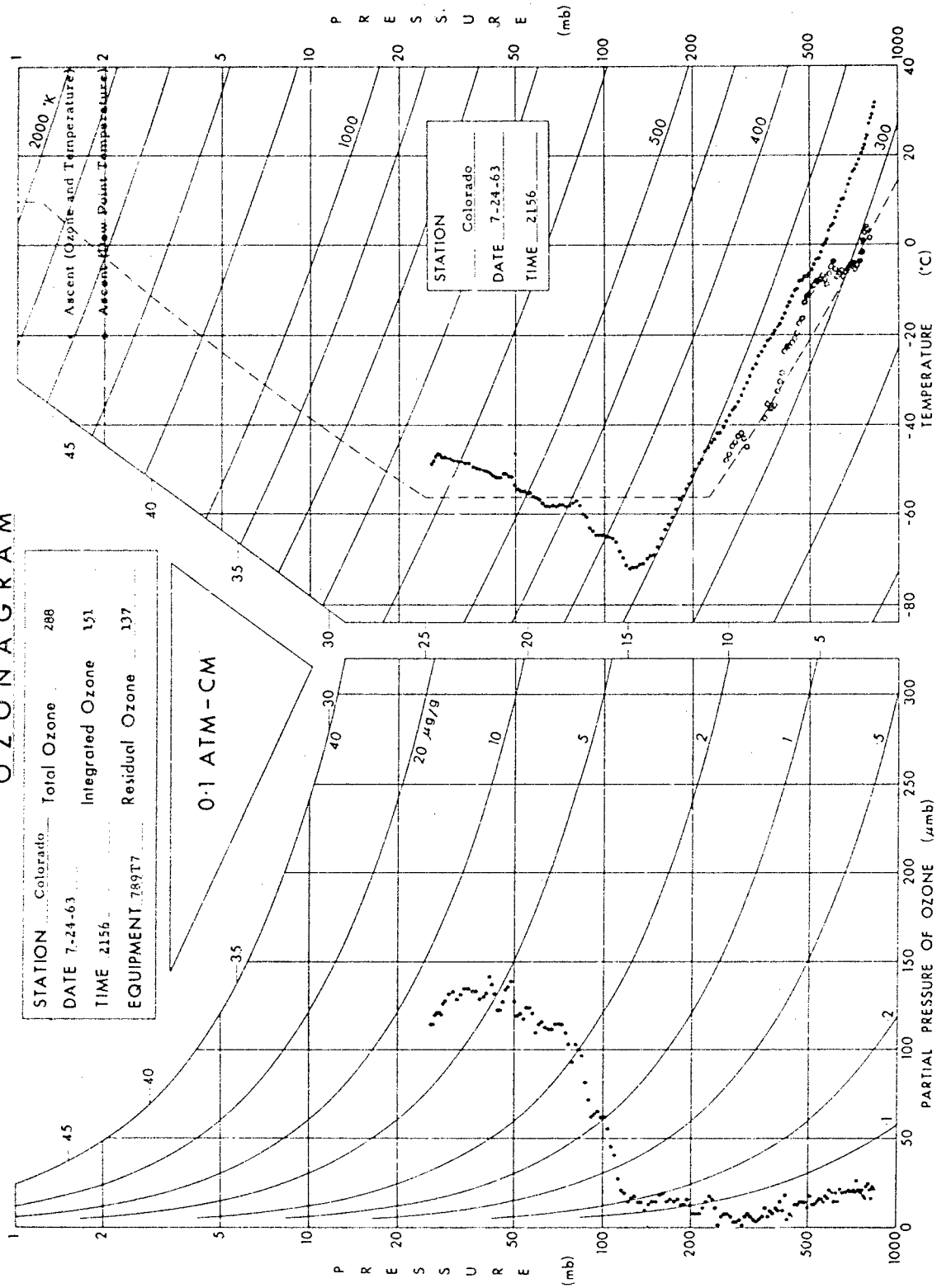




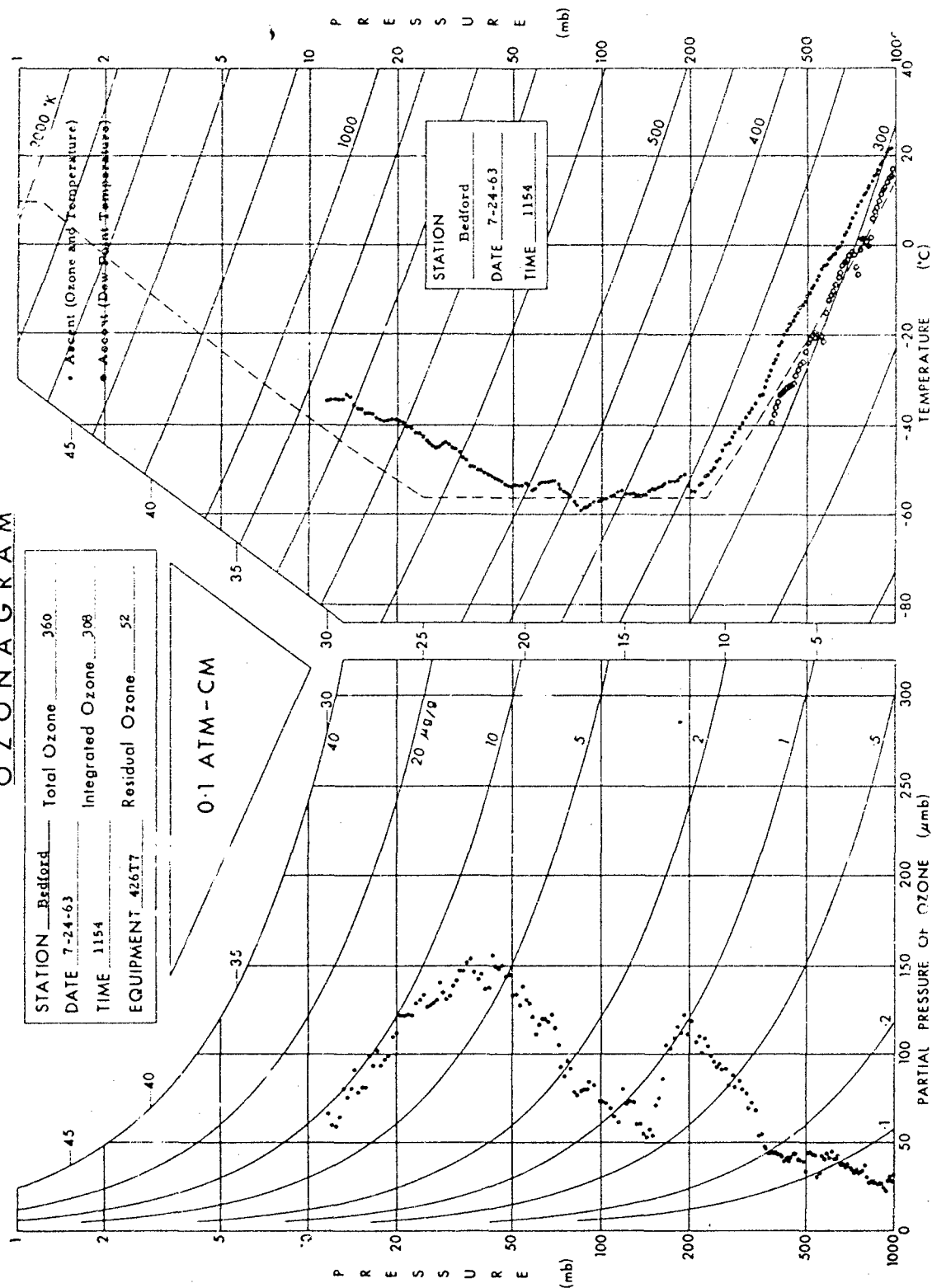




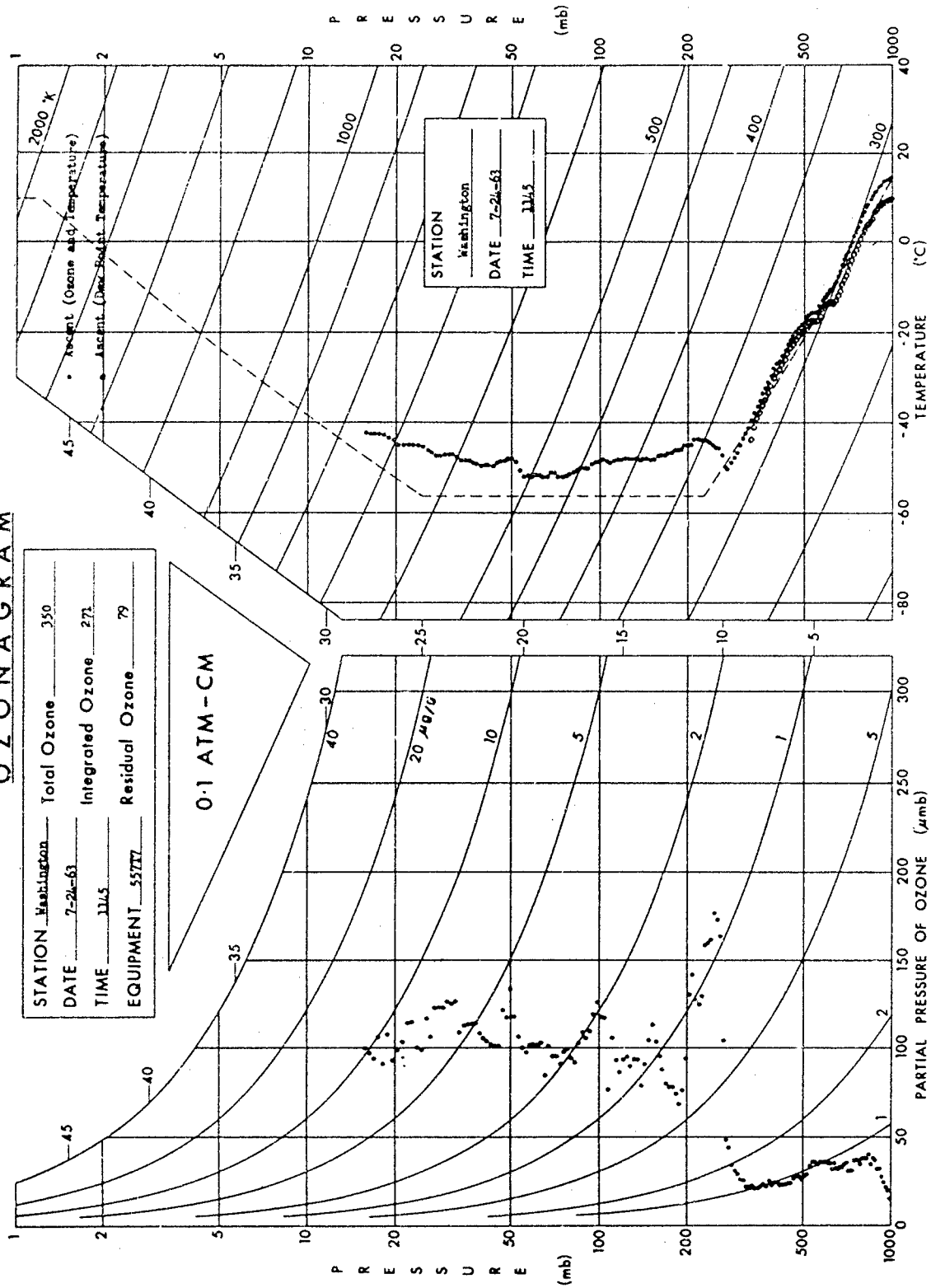
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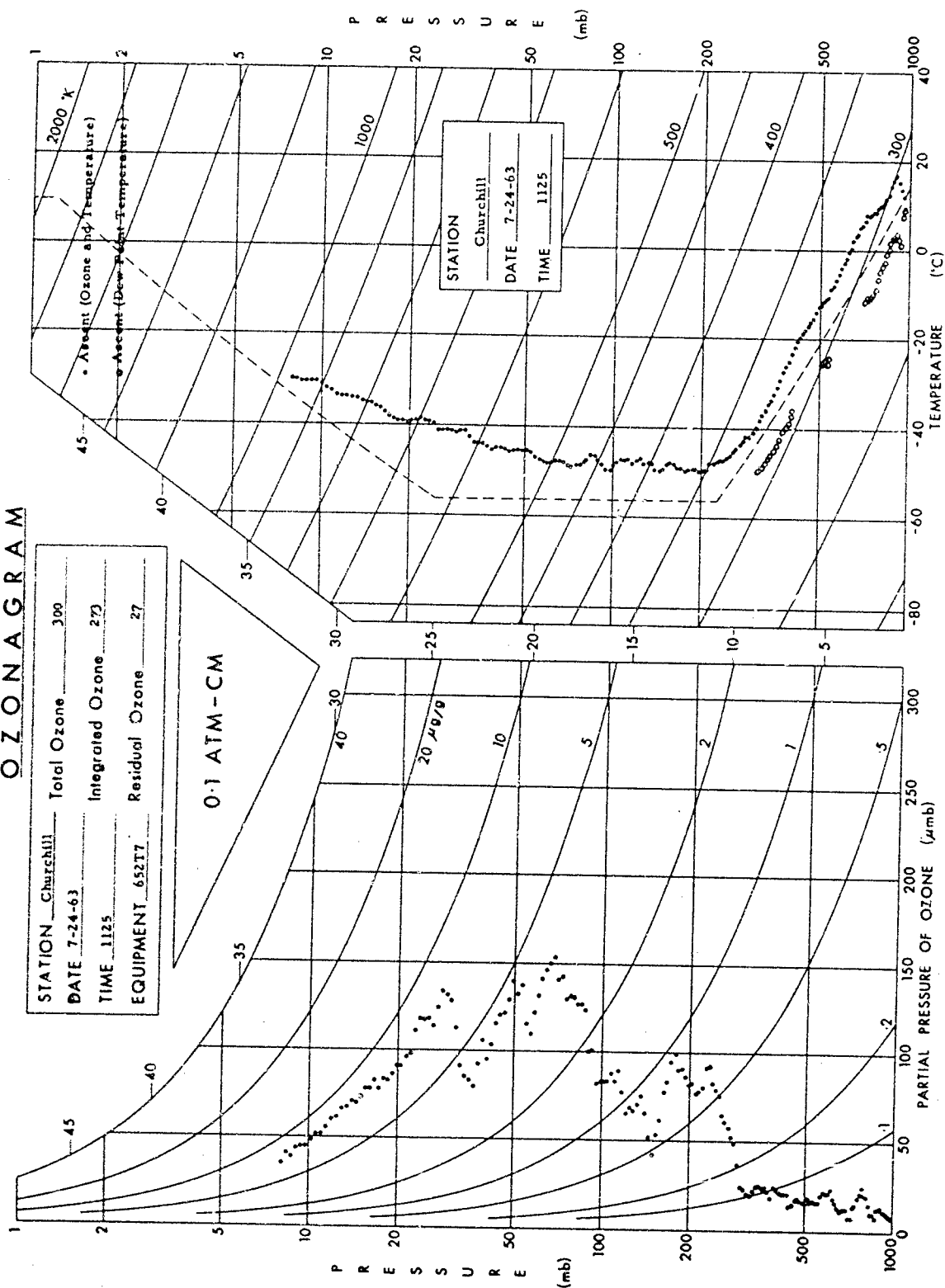
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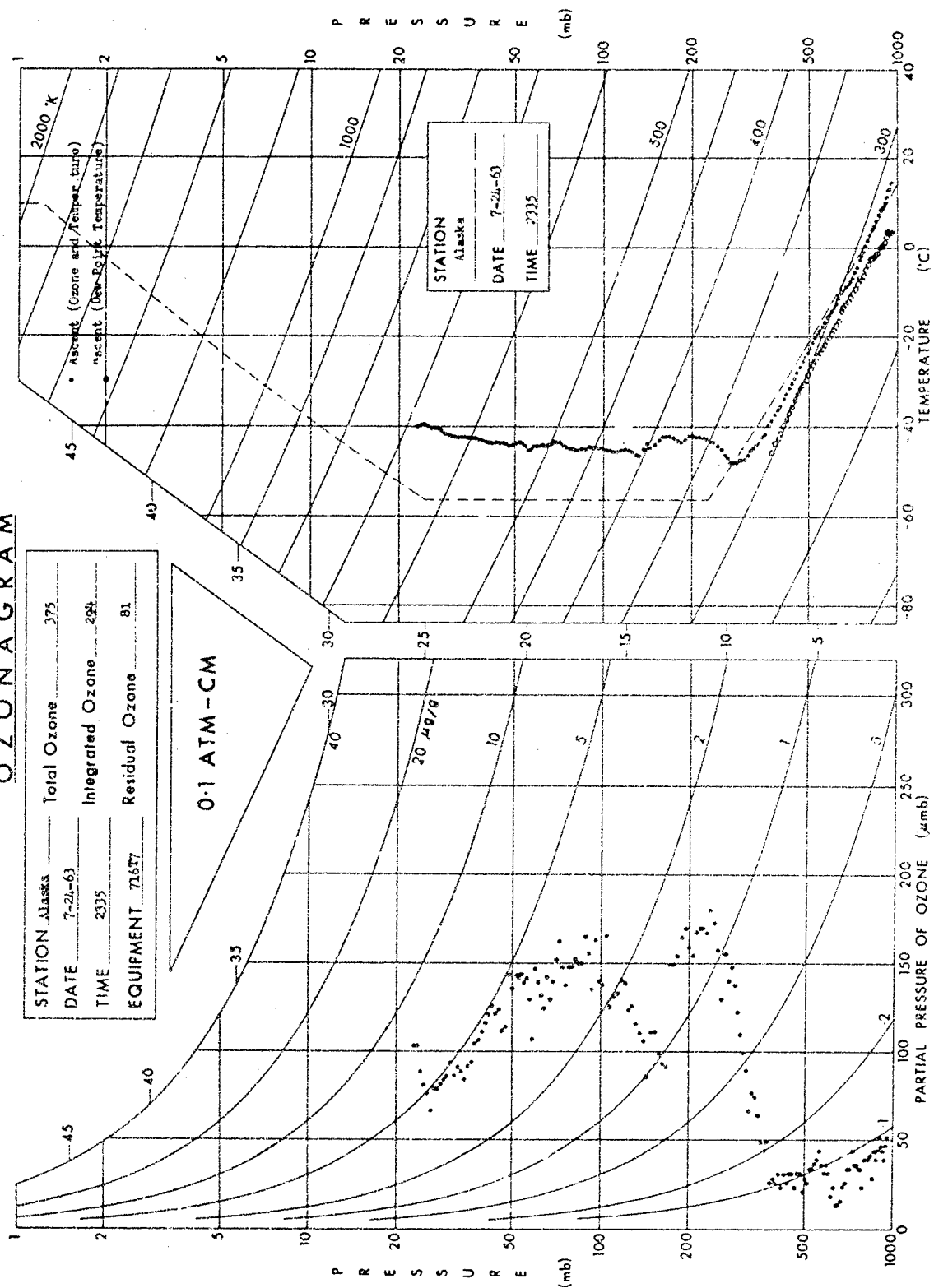
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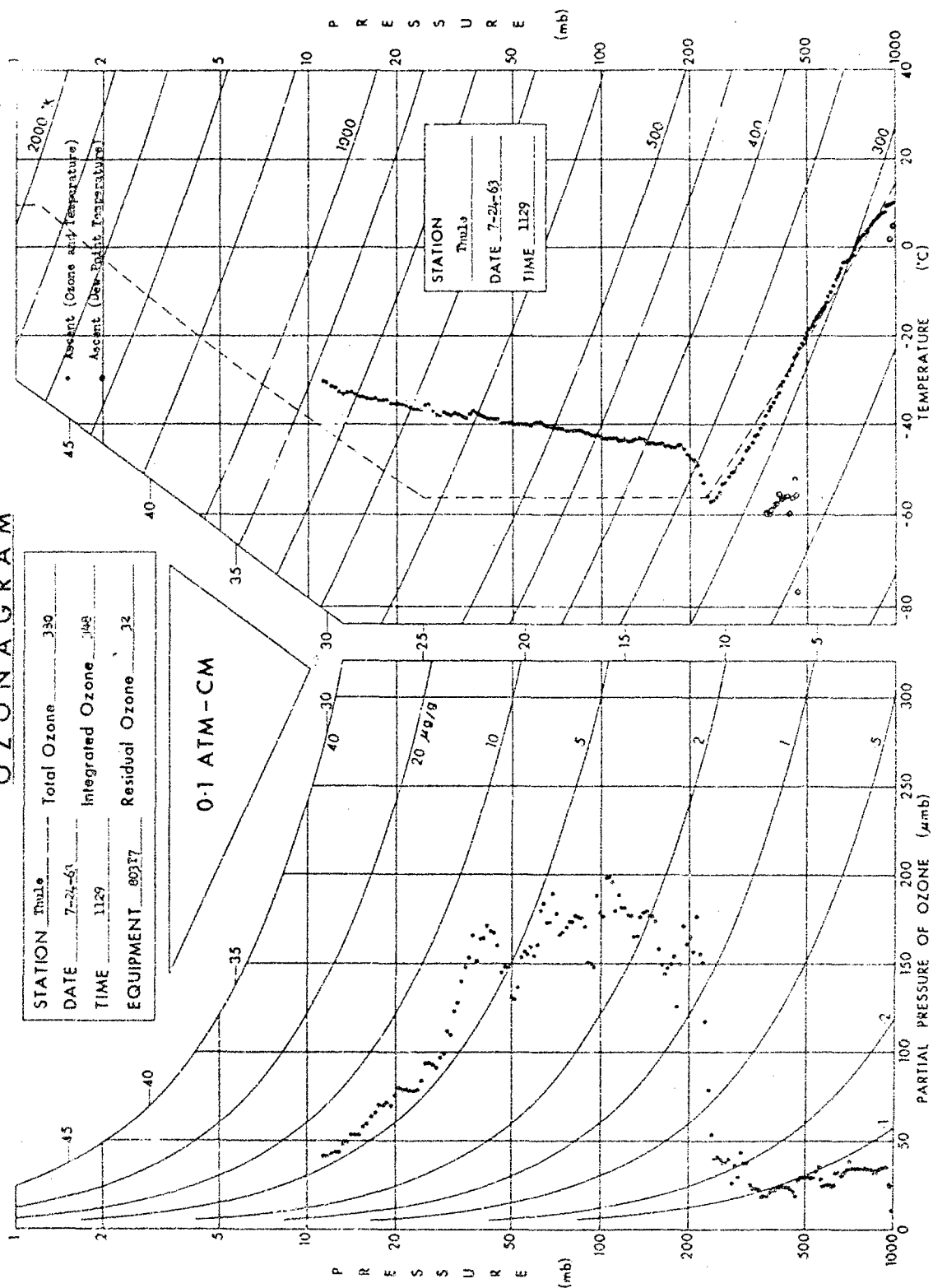
## OZONAGRAM



## OZONAGRAM



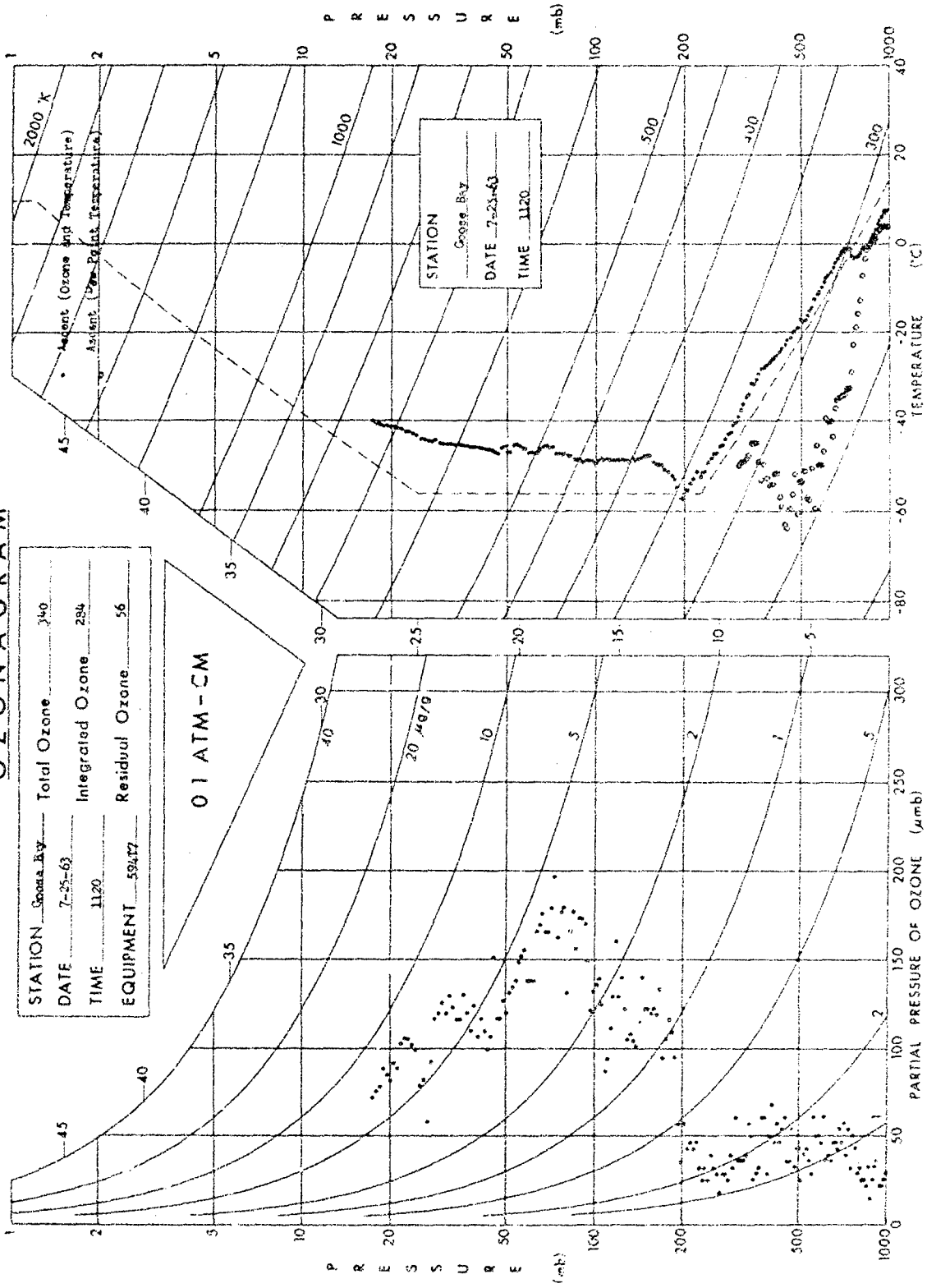
## O Z O N A G R A M



## O Z O N A G R A M

STATION Goose Bay Total Ozone 340  
 DATE 7-25-63 Integrated Ozone 284  
 TIME 1120 Residual Ozone 56  
 EQUIPMENT 59477

01 ATM - CM

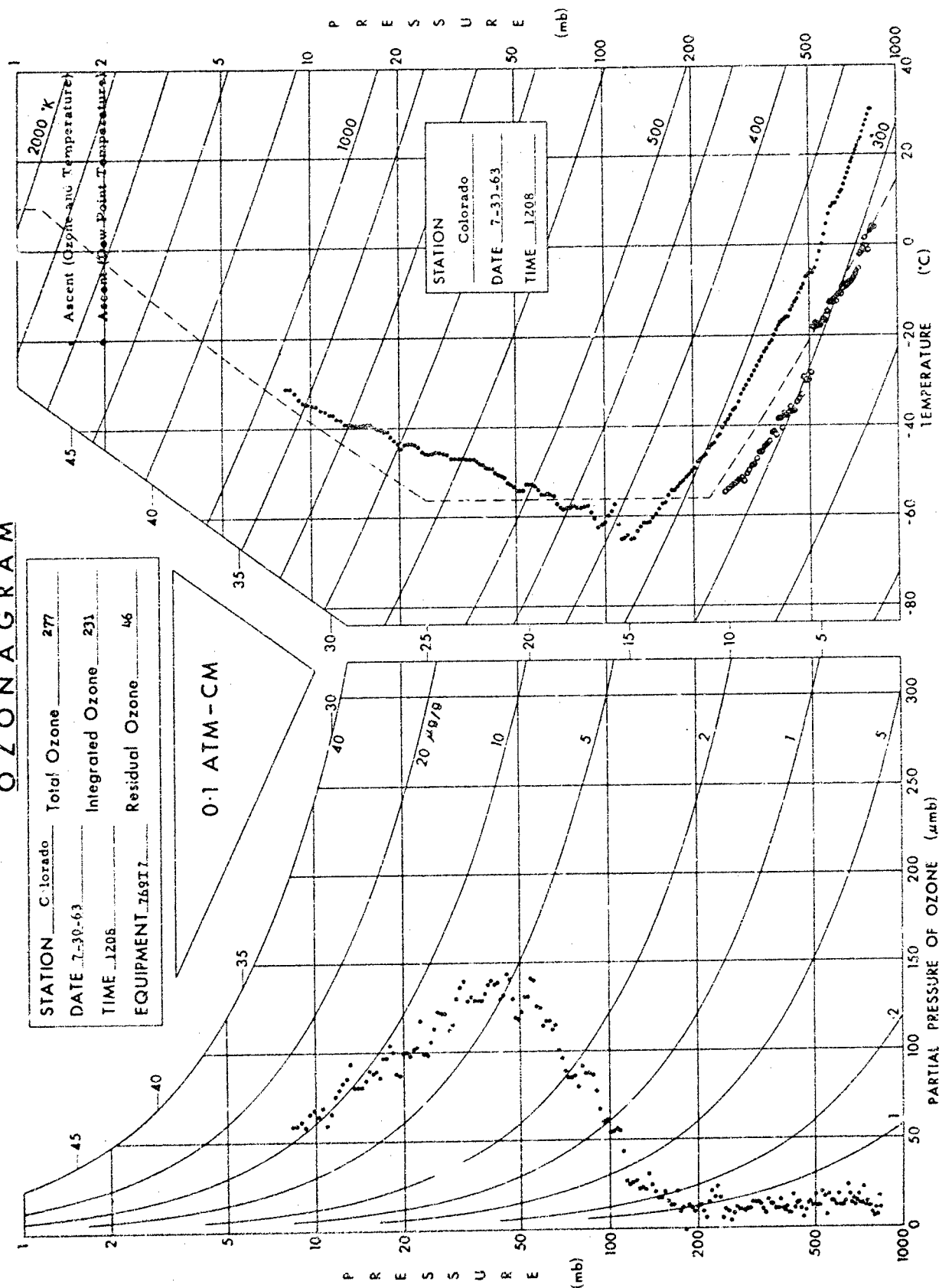




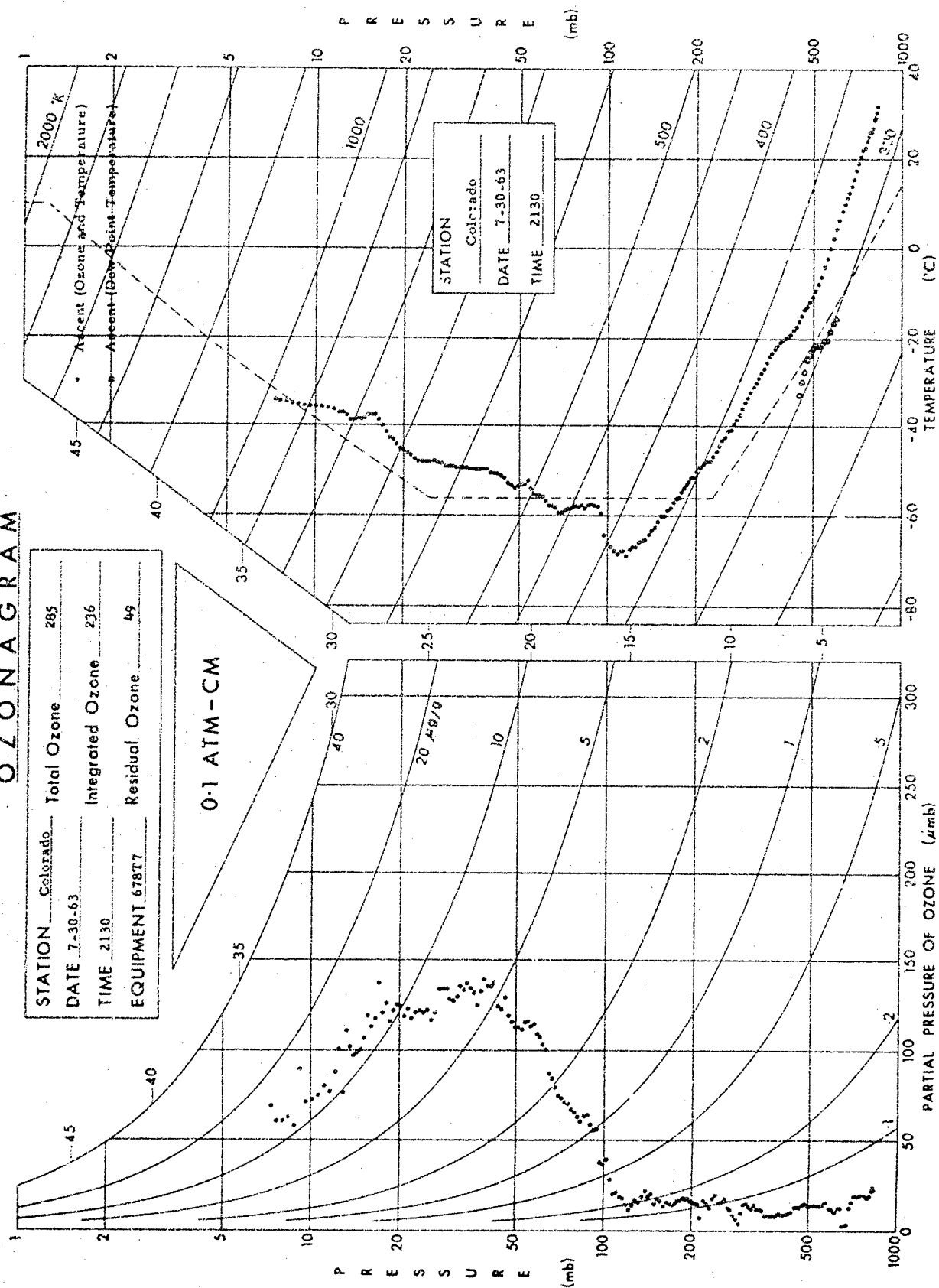
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STATION C. Colorado Total Ozone 277  
 DATE 7-30-63 Integrated Ozone 231  
 TIME 1208 Residual Ozone 46  
 EQUIPMENT 769T7

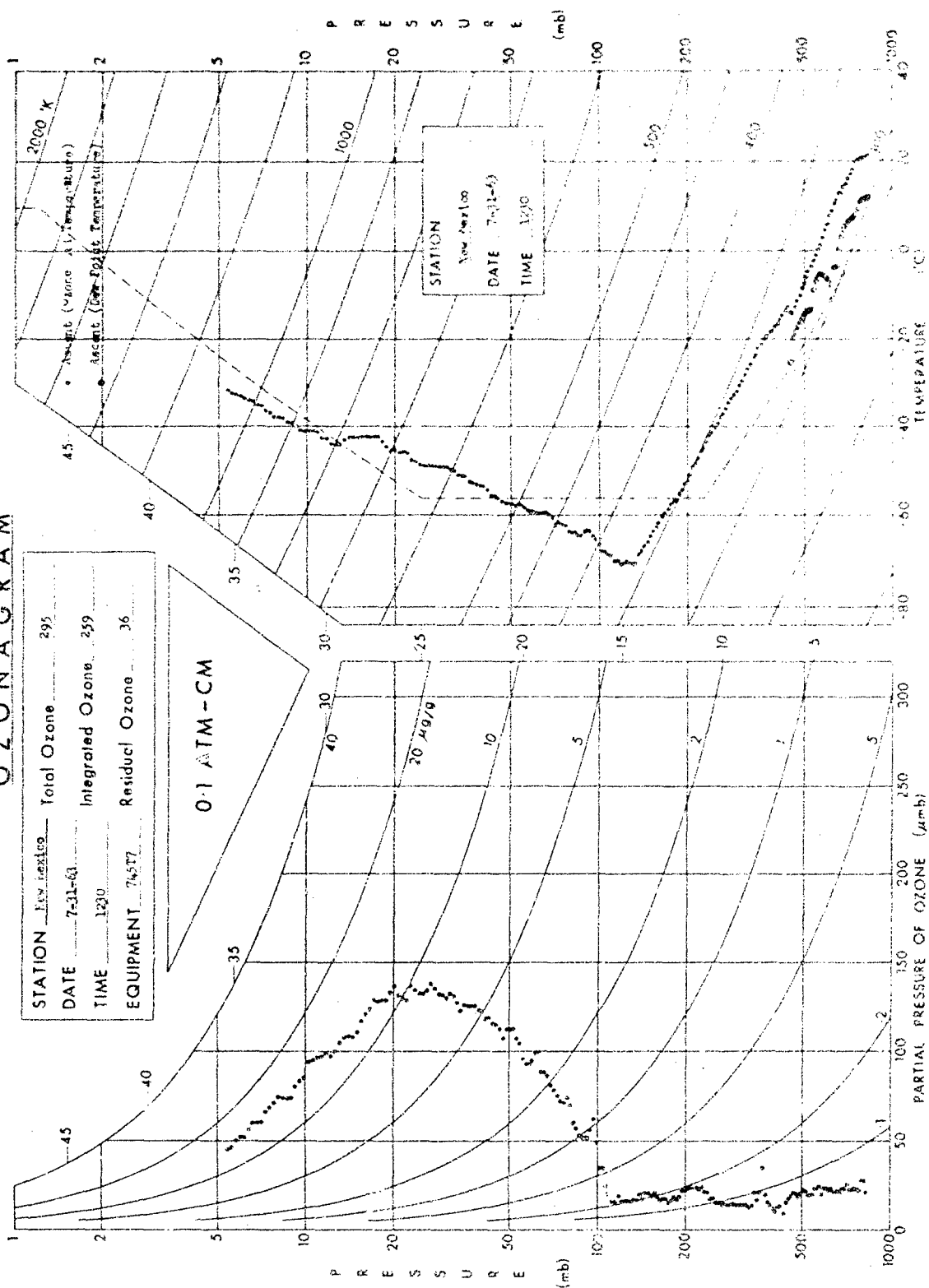
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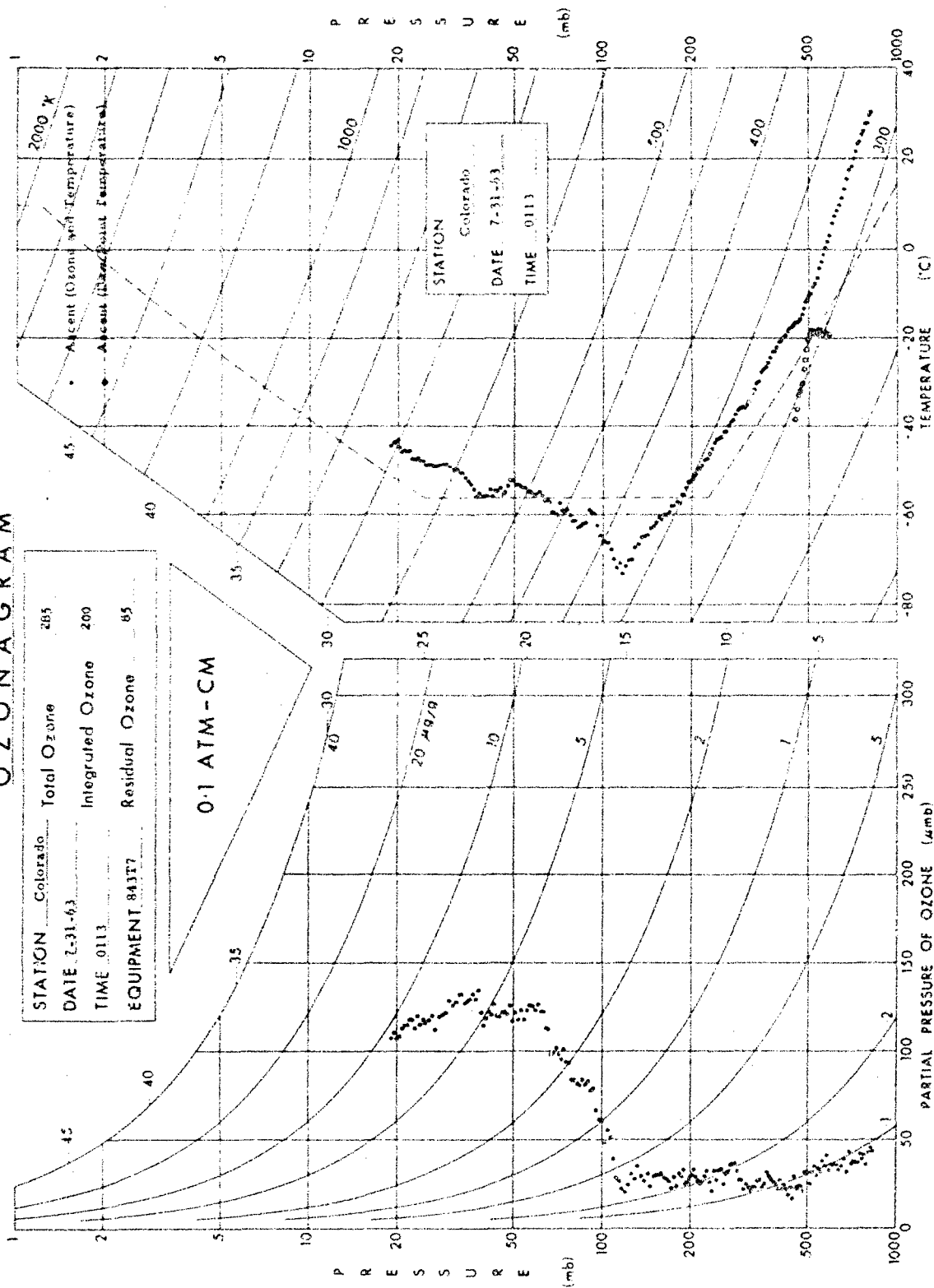
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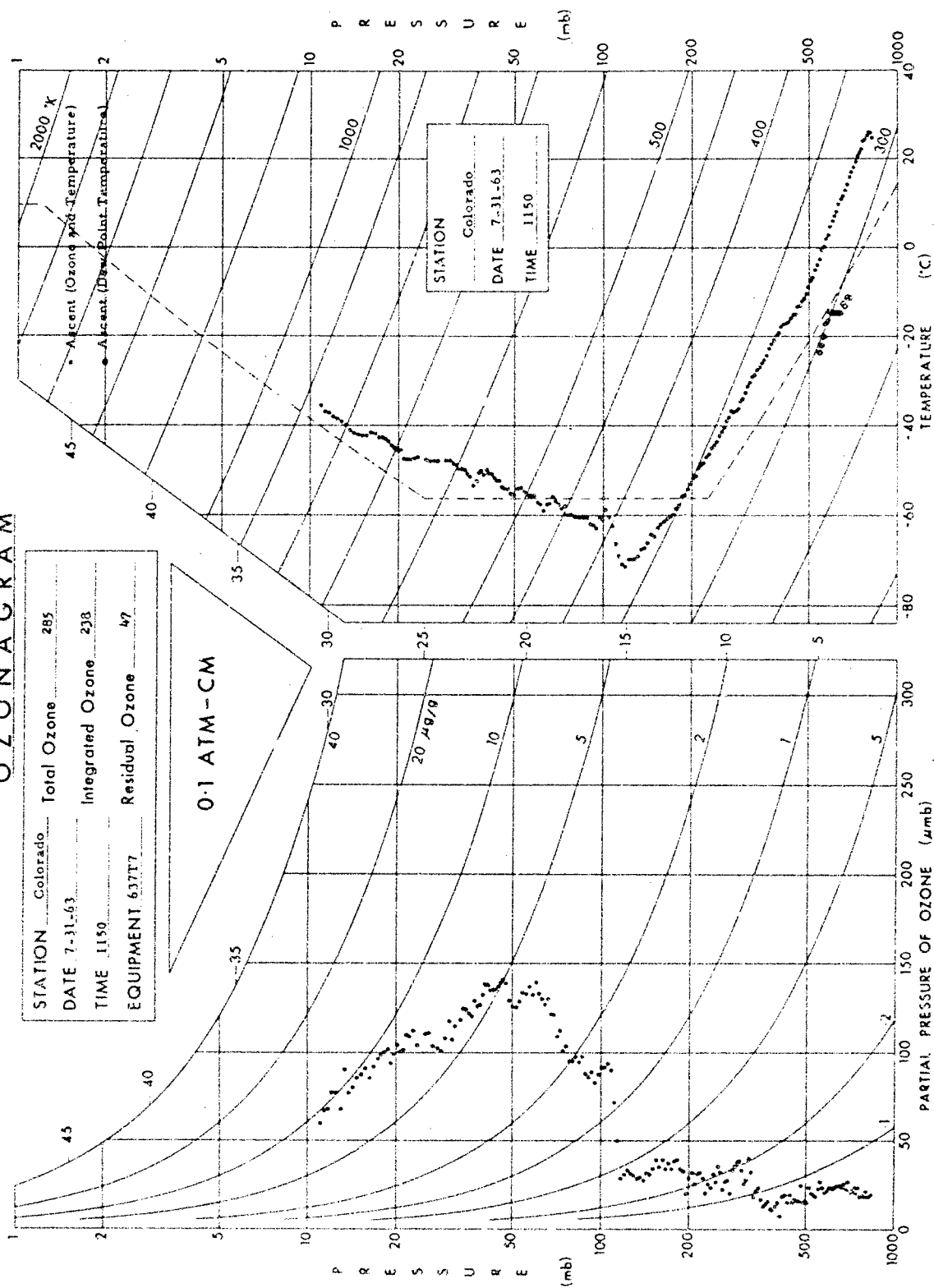
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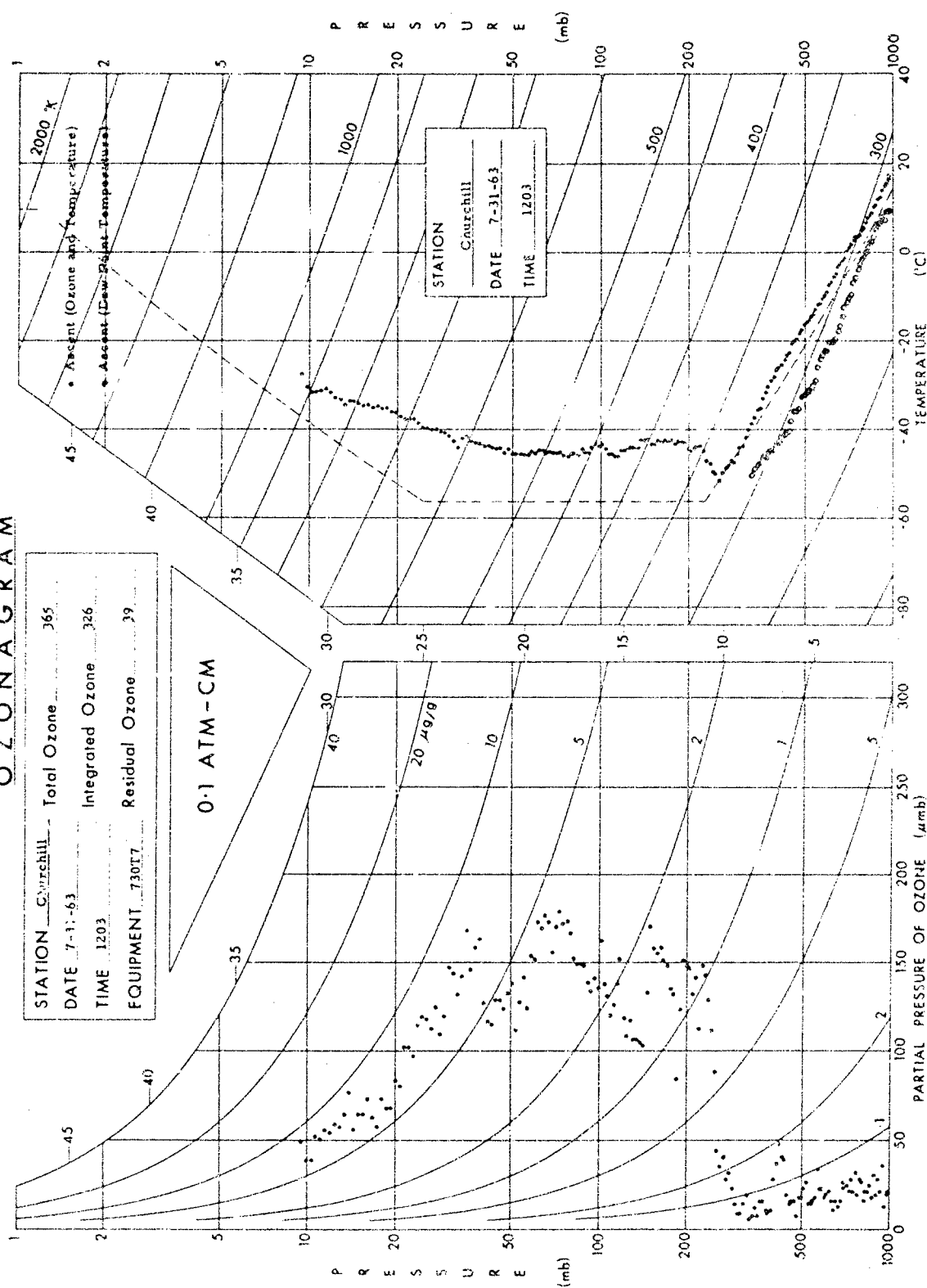
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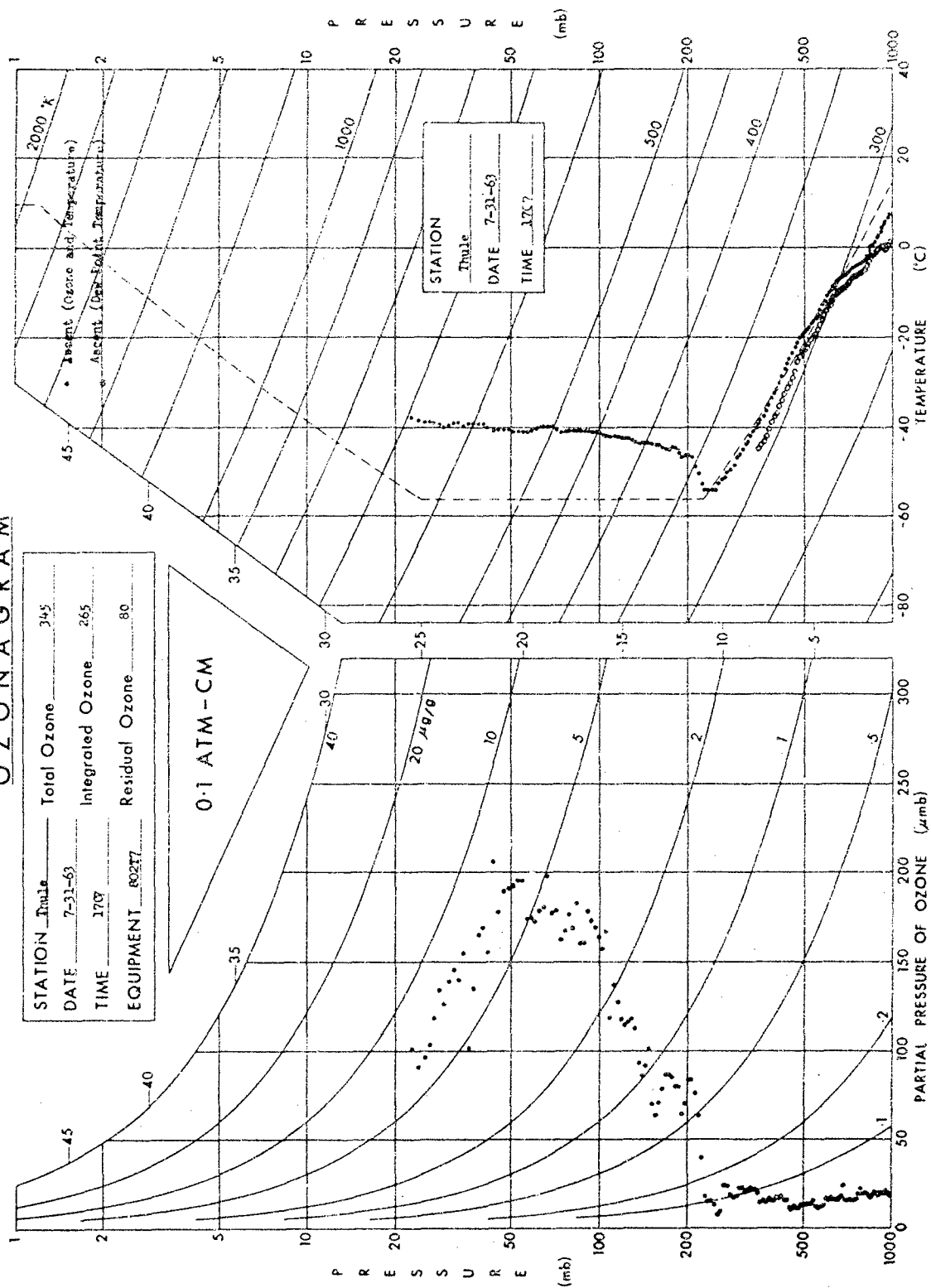
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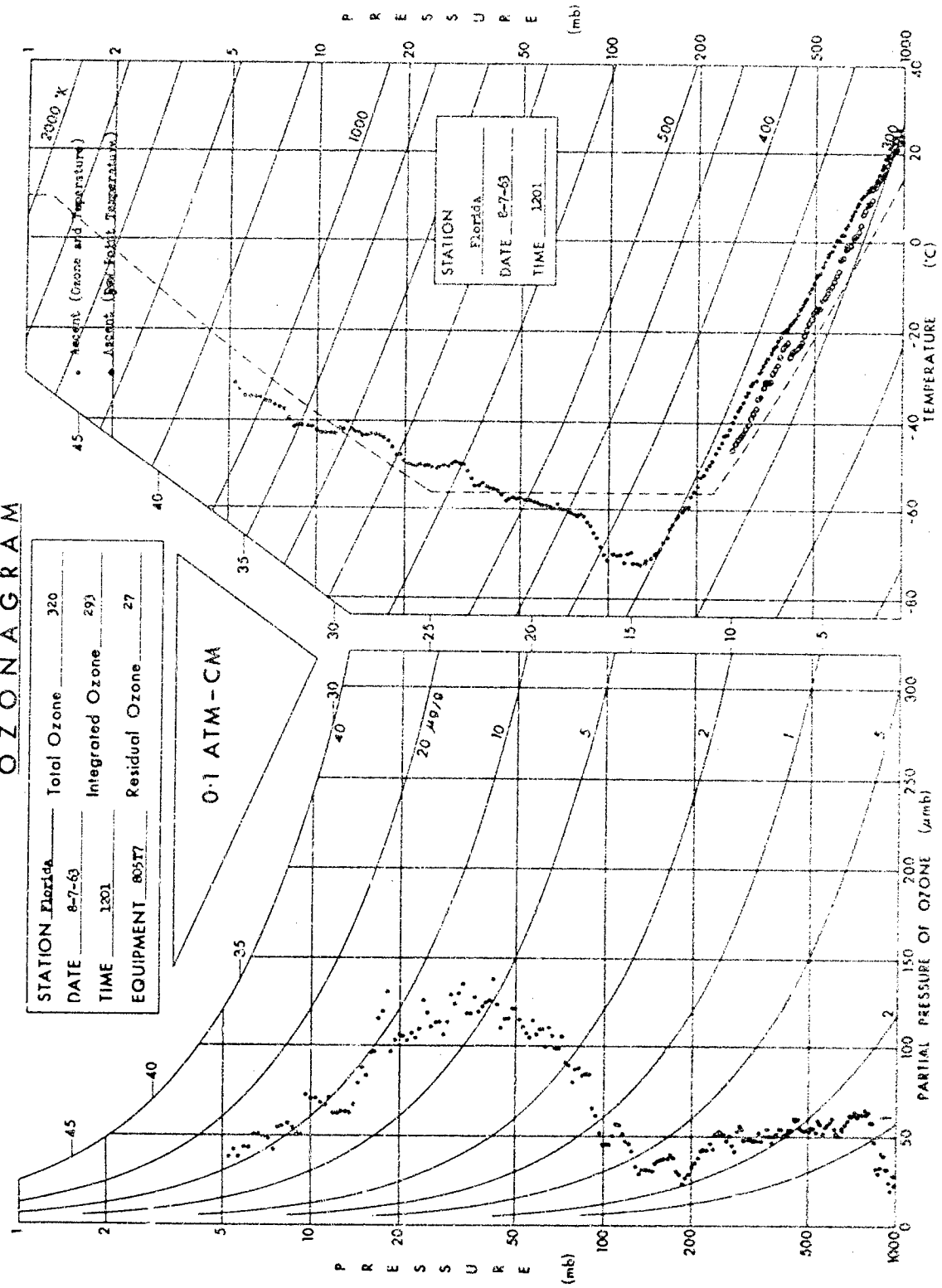
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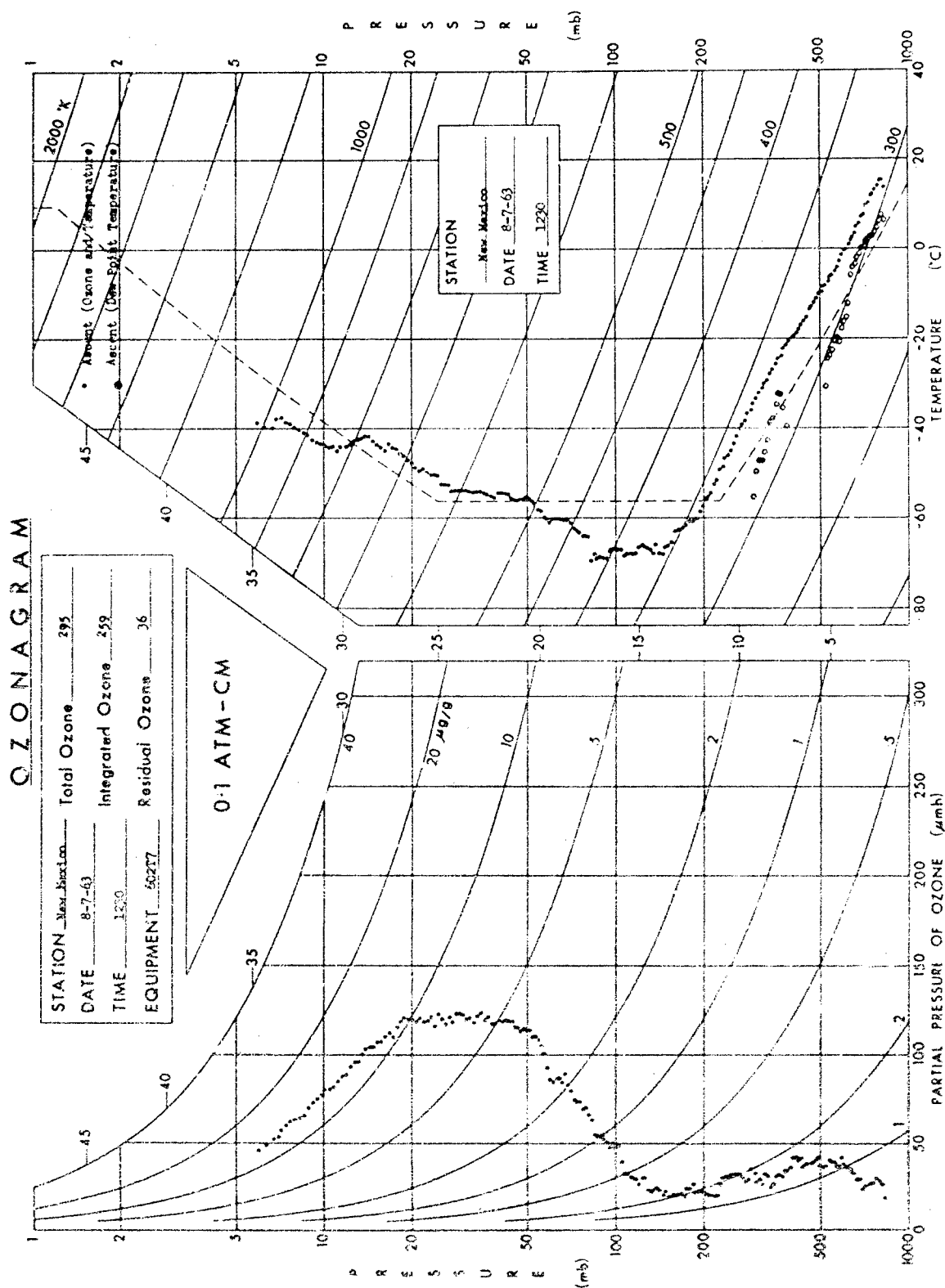
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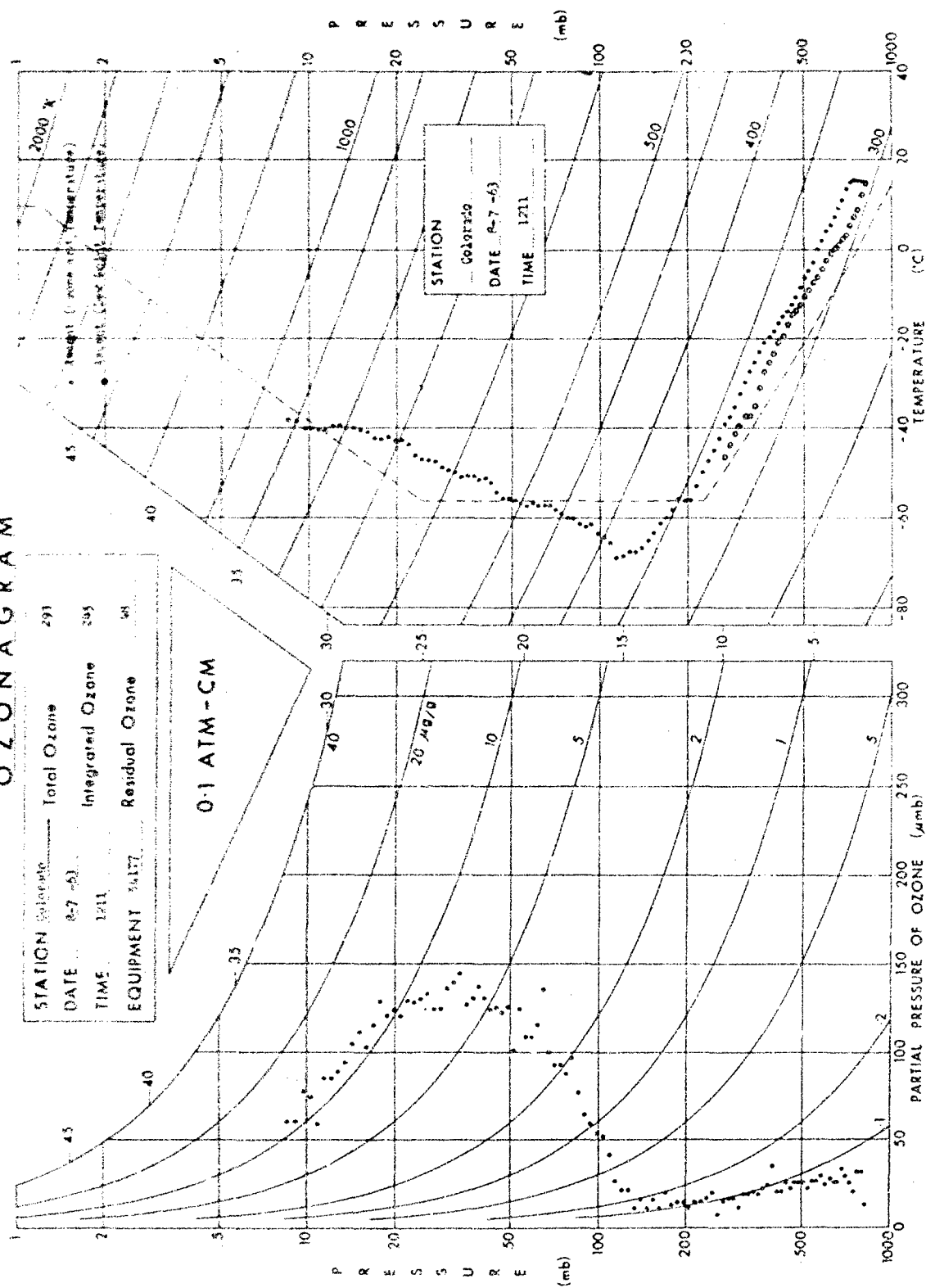
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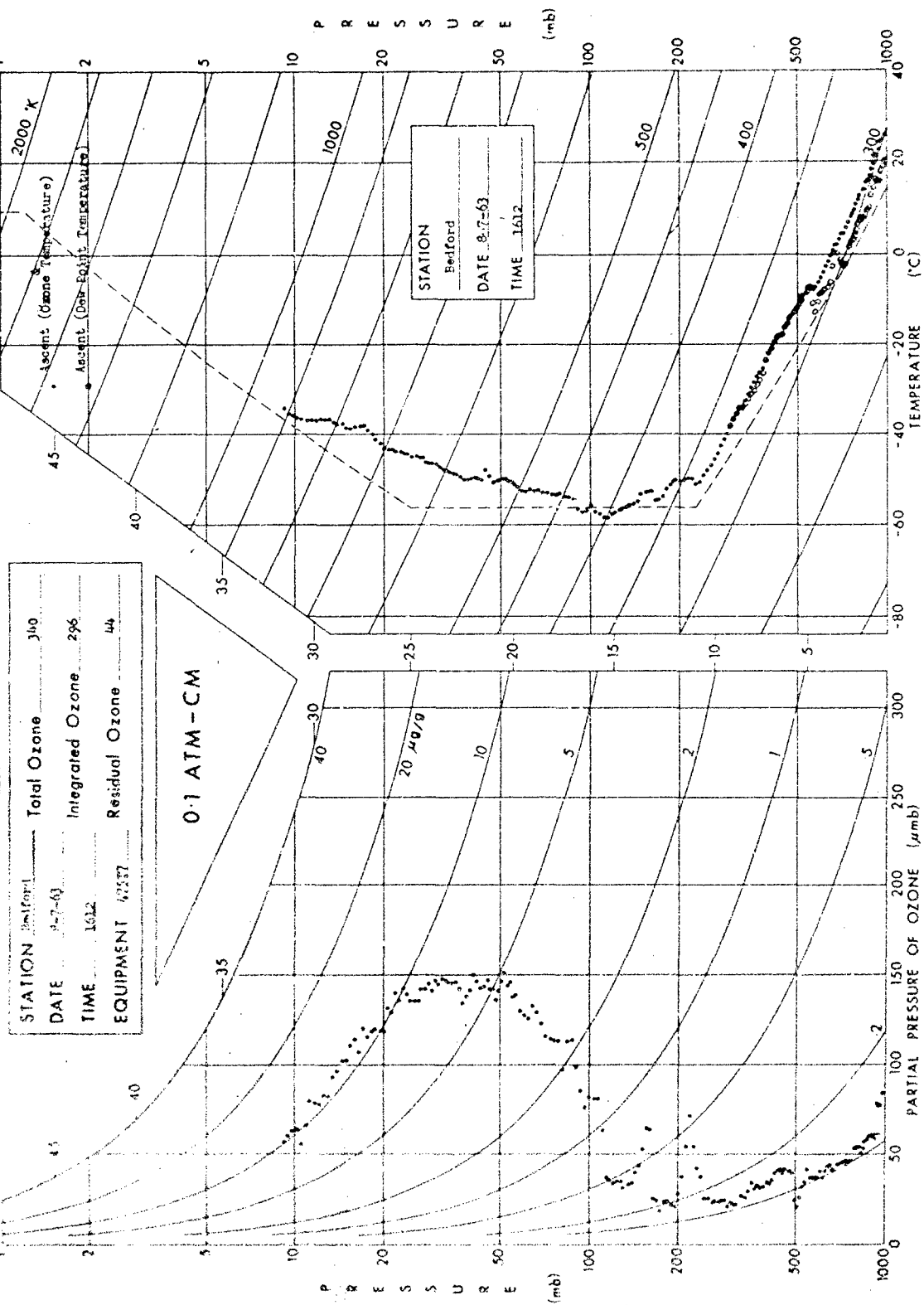


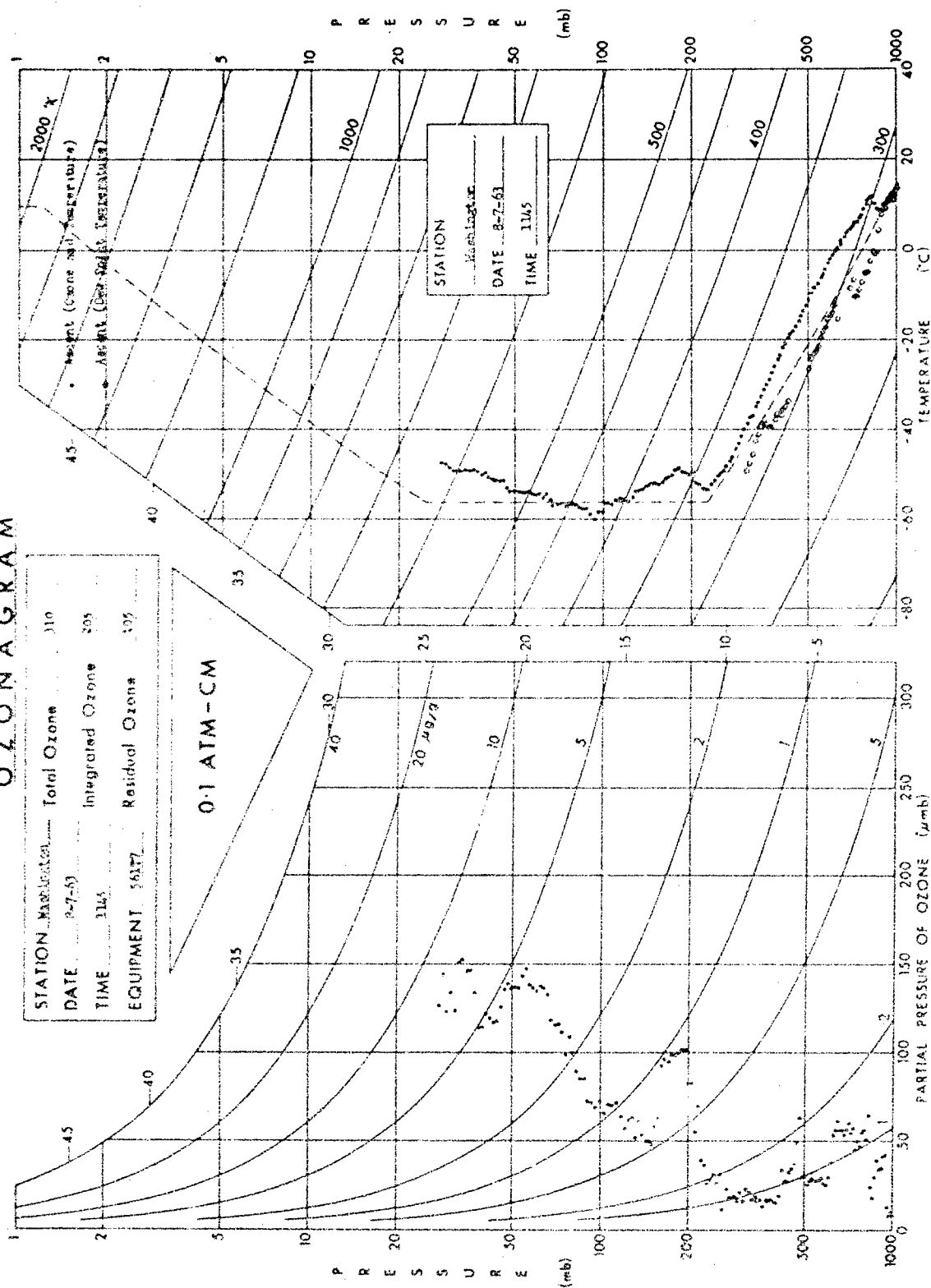


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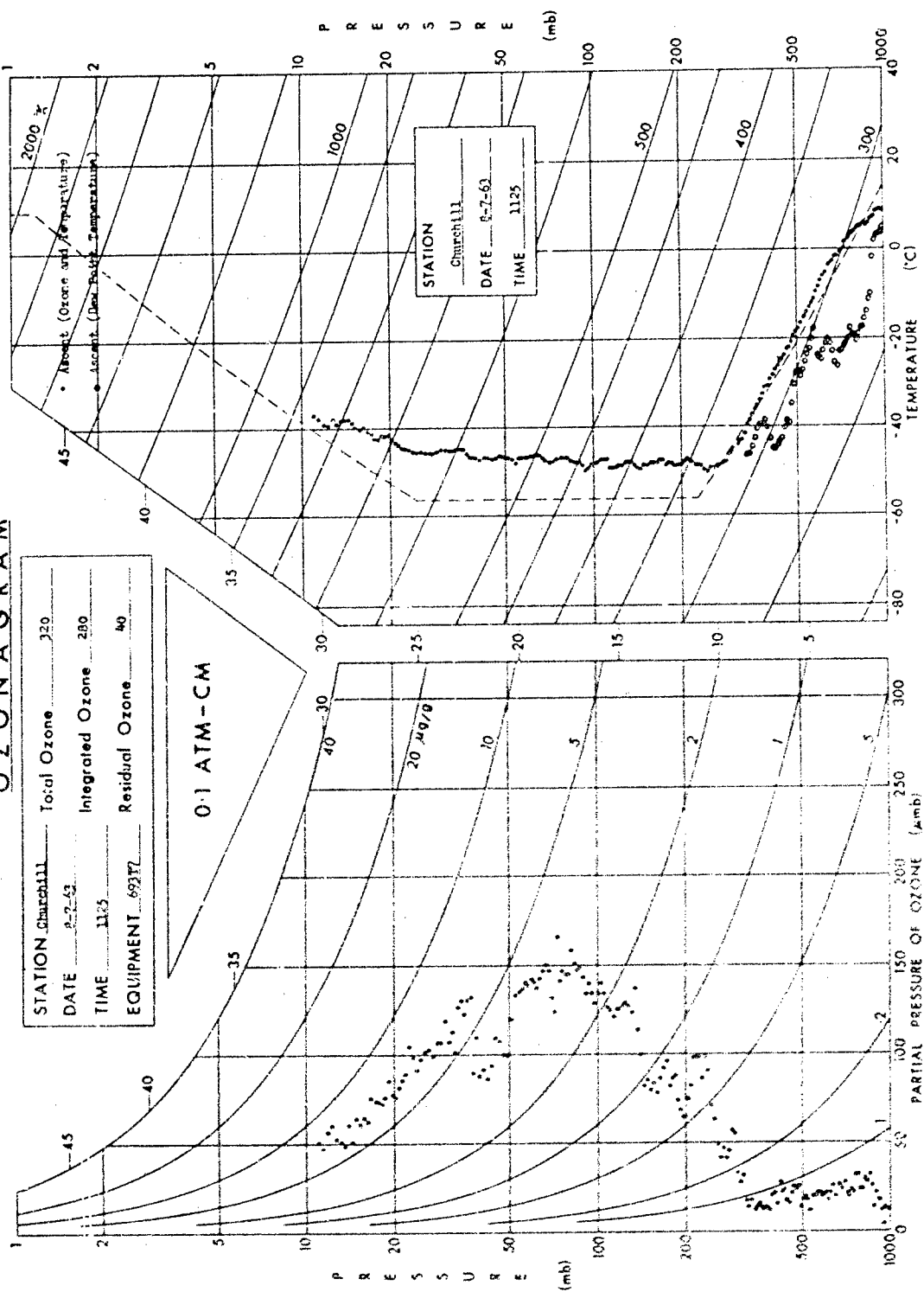


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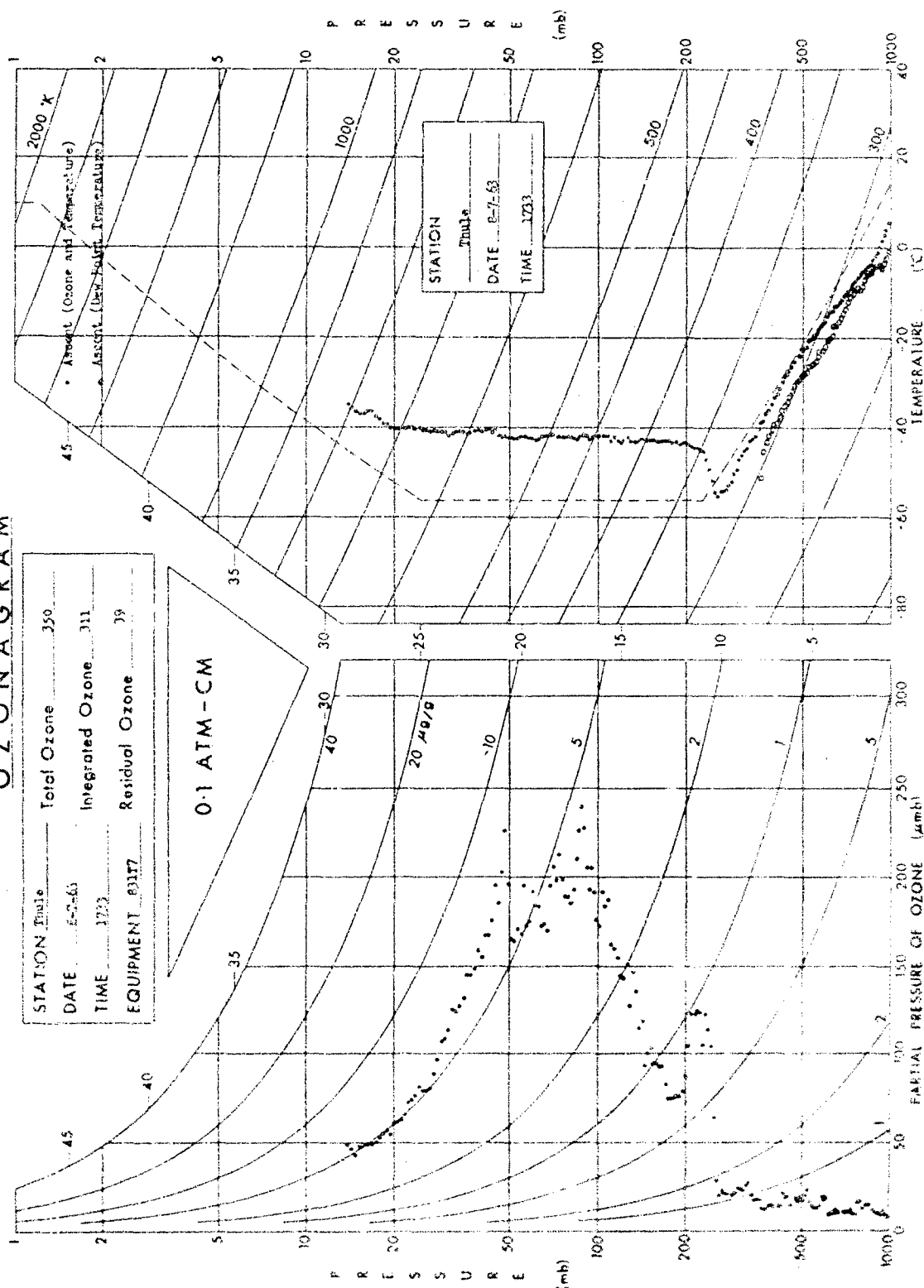




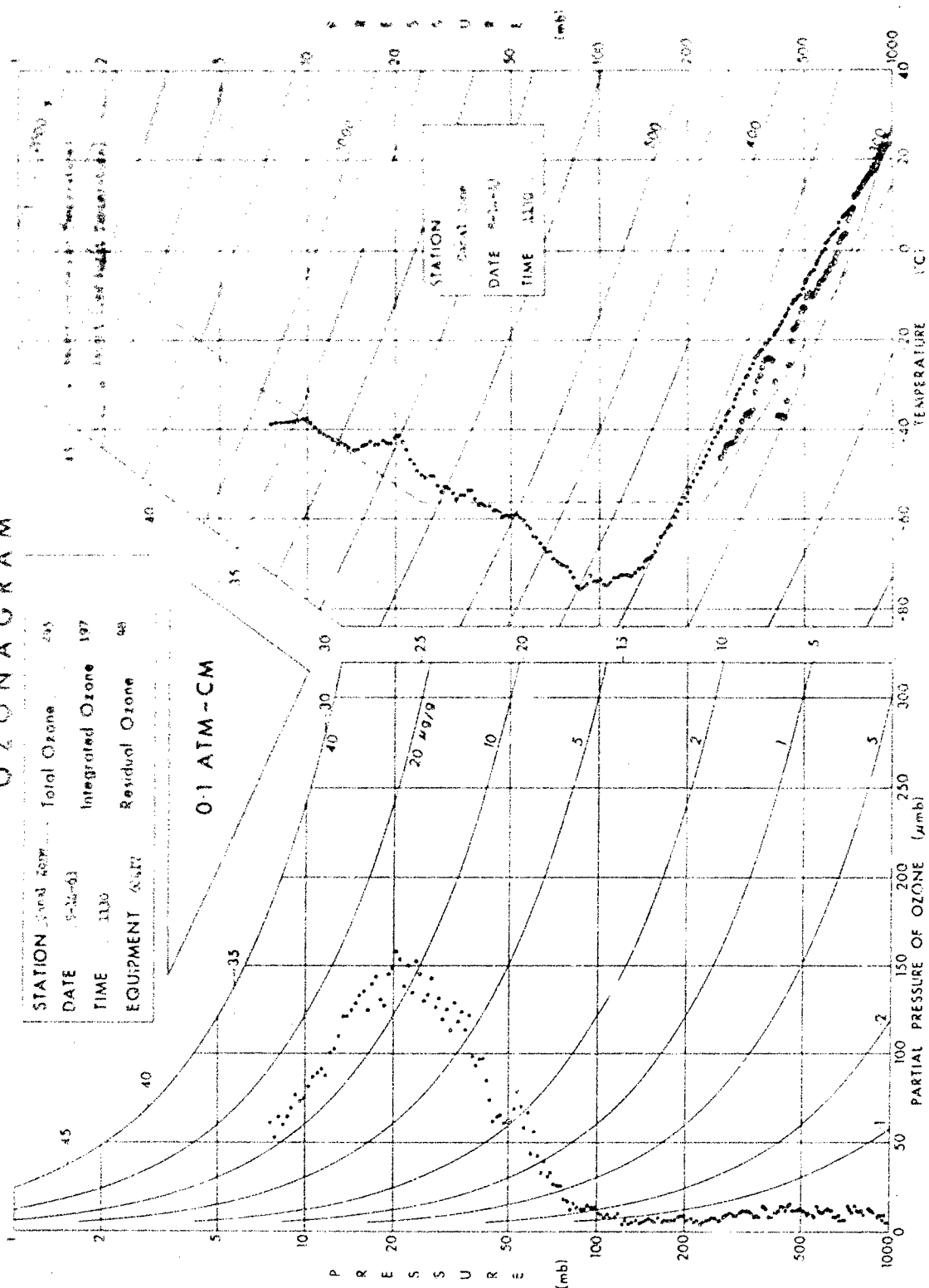
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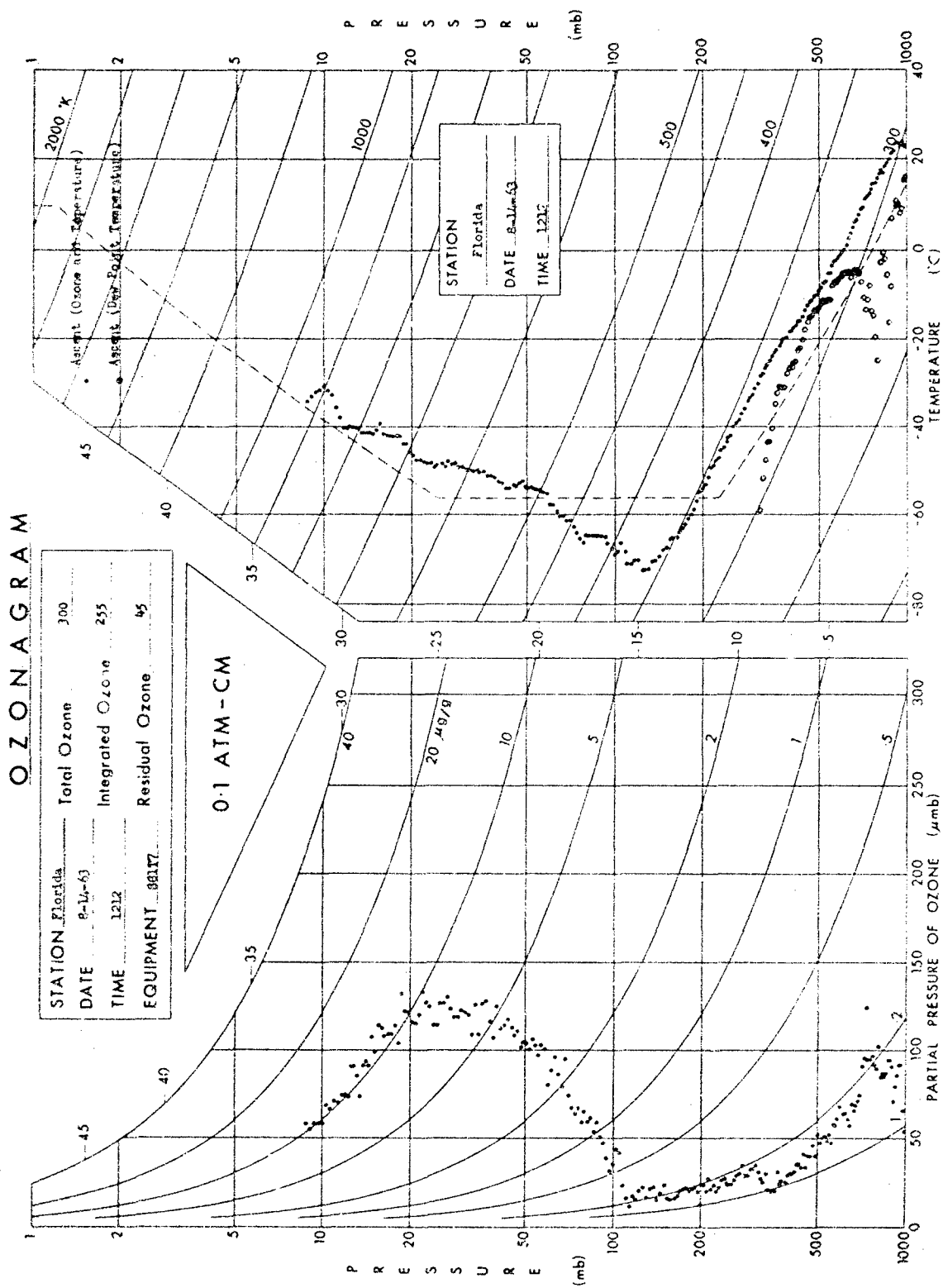


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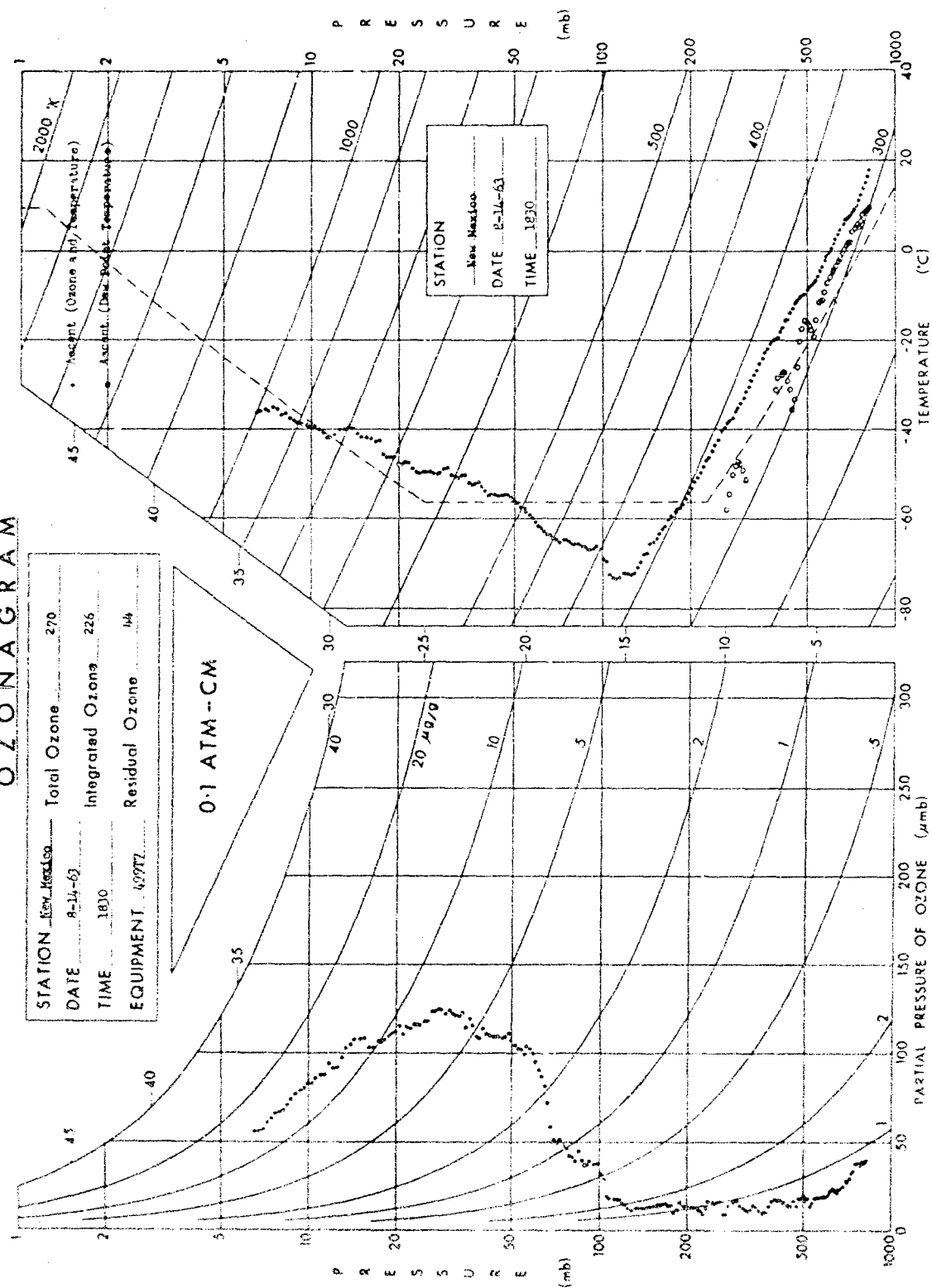
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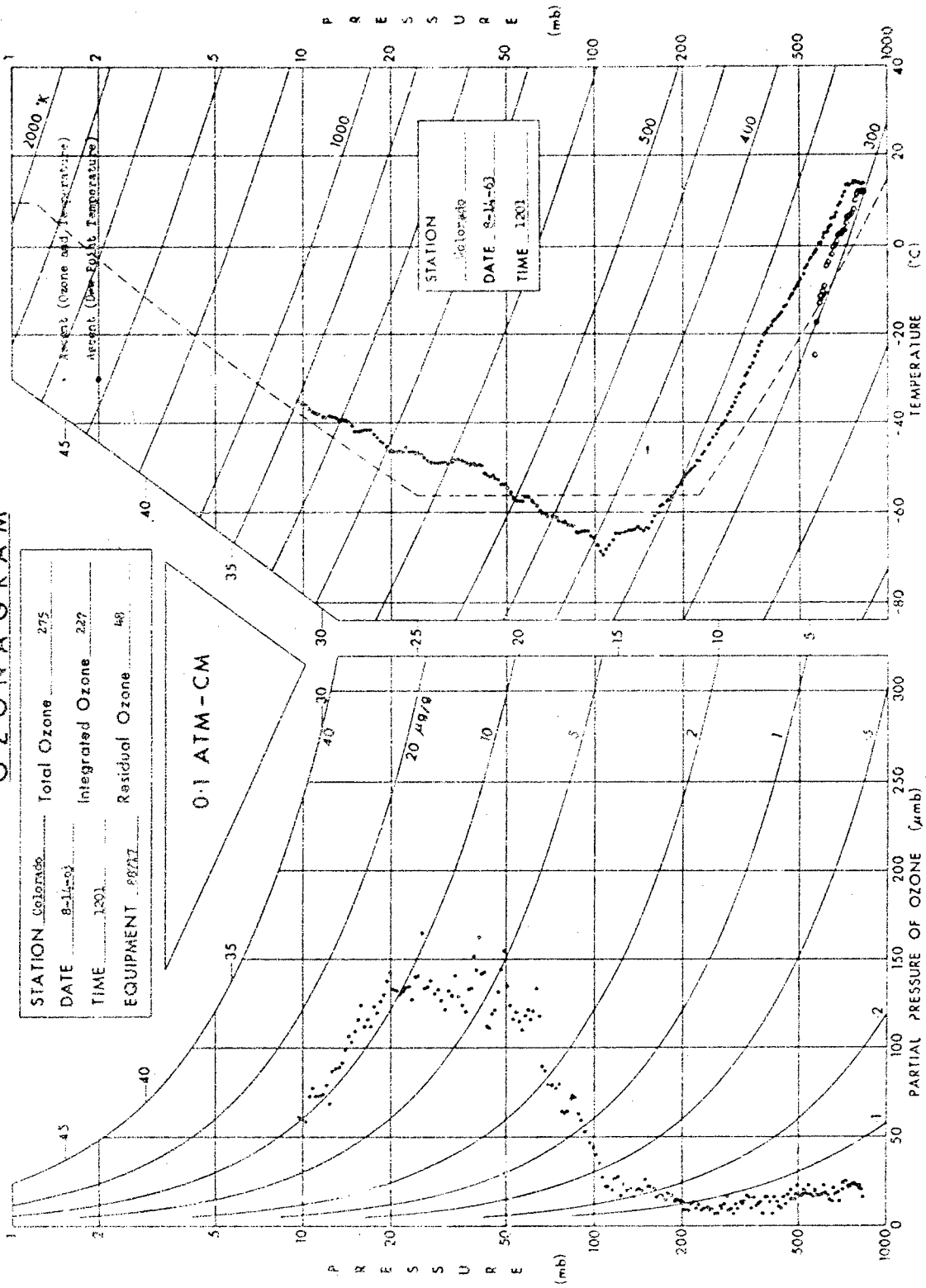




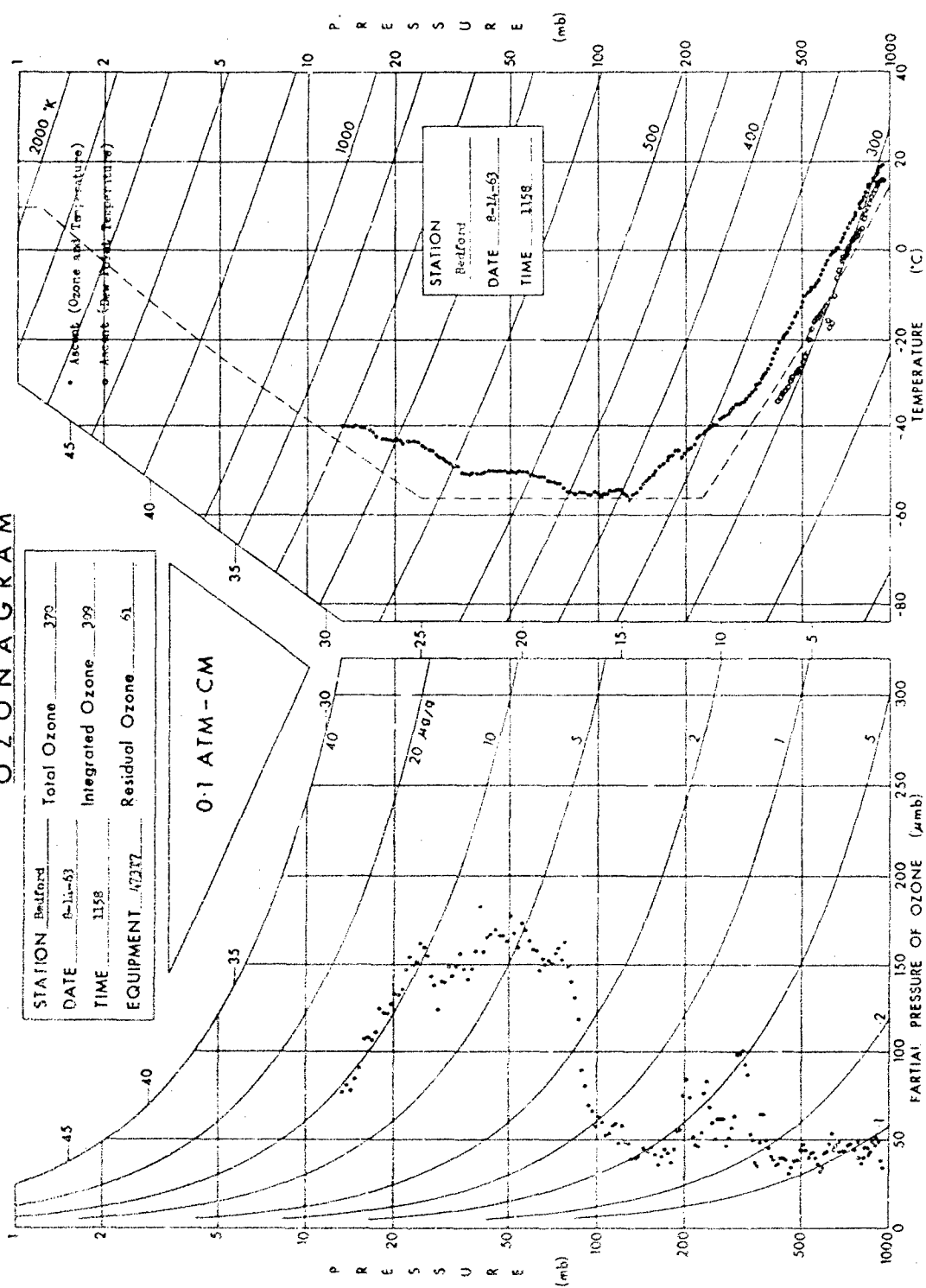
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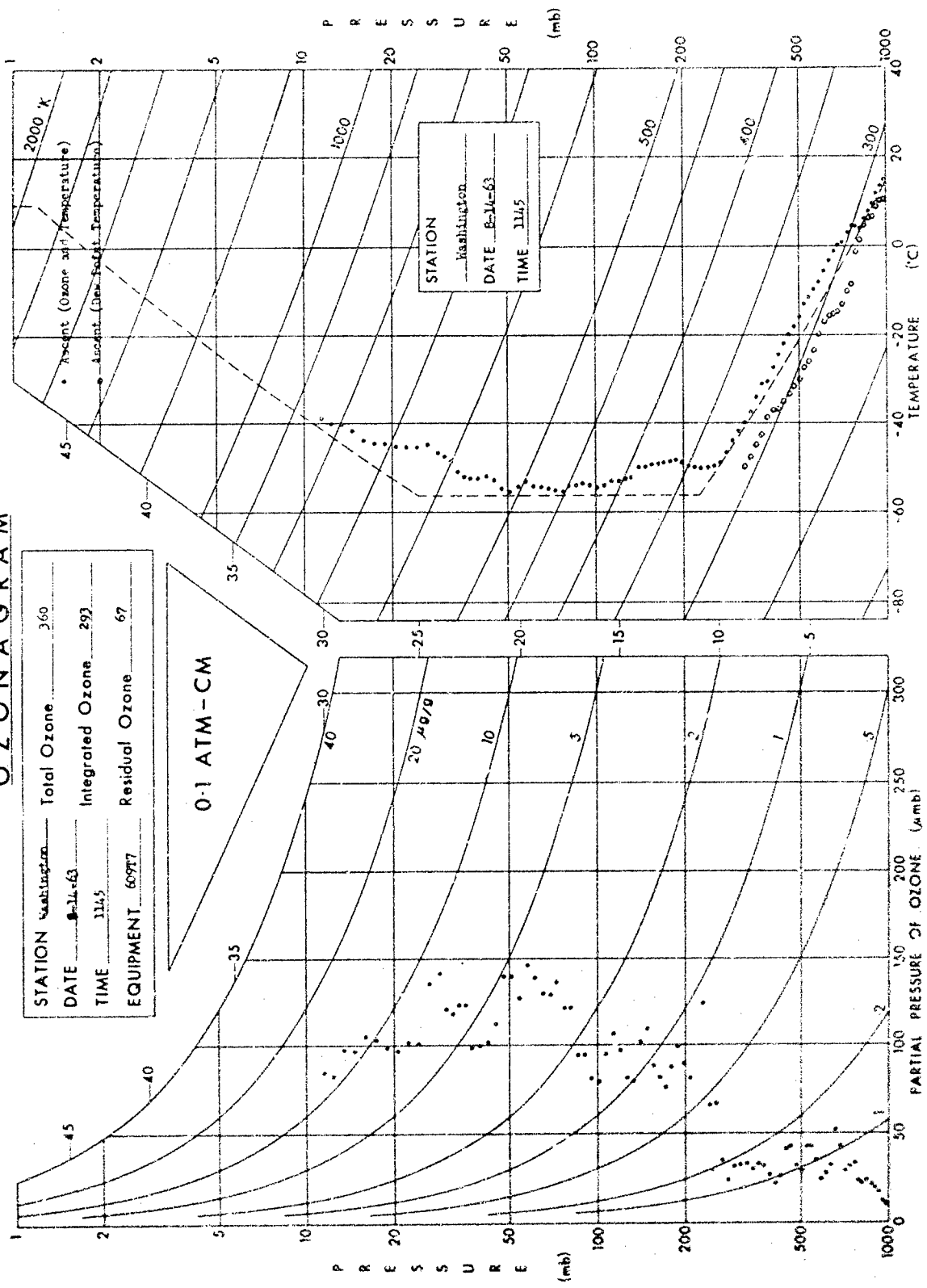
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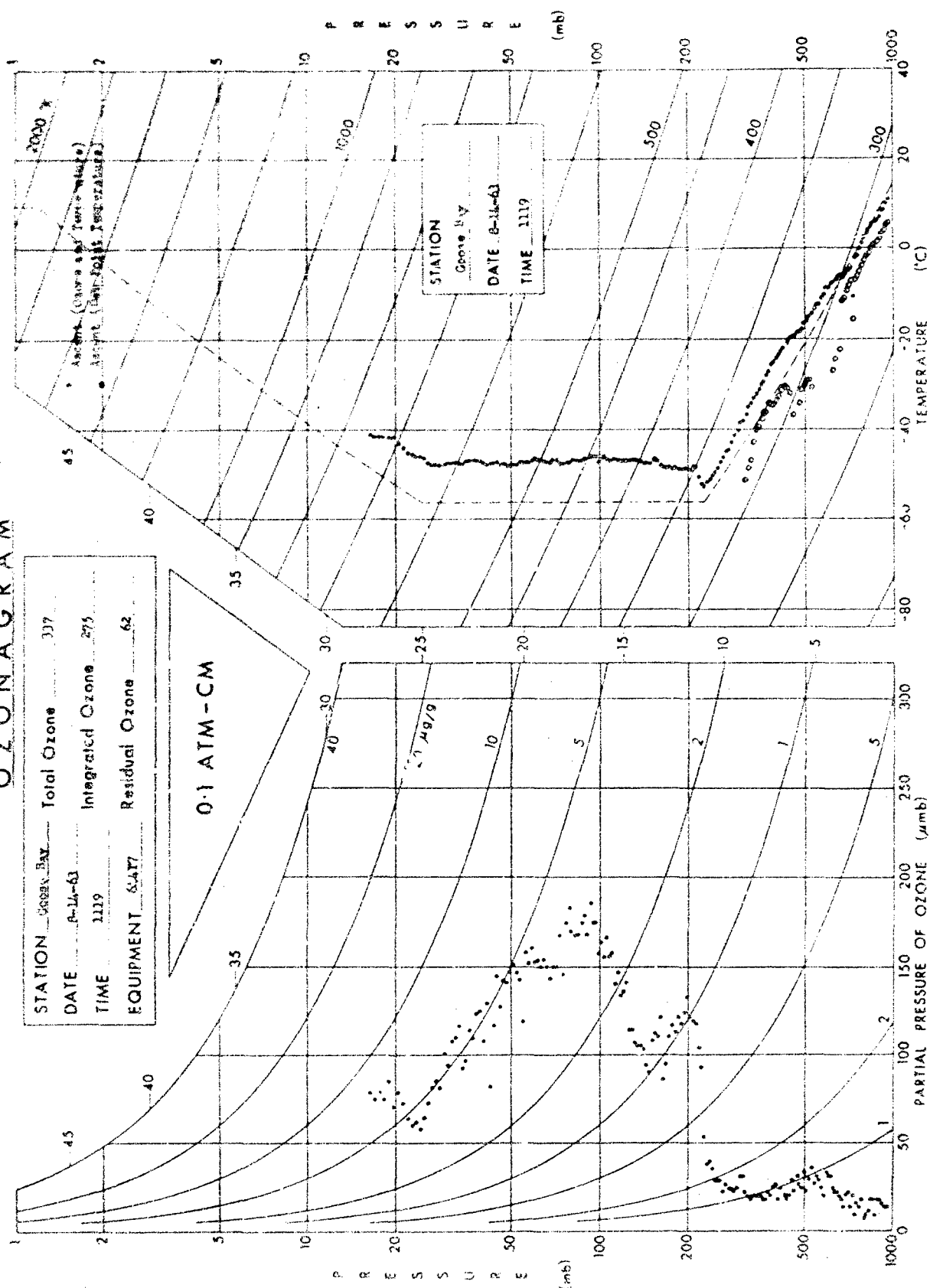
# OZONAGRAM

STATION	Washington	Total Ozone	360
DATE	8-14-63	Integrated Ozone	293
TIME	1145	Residual Ozone	67
EQUIPMENT	609T7		

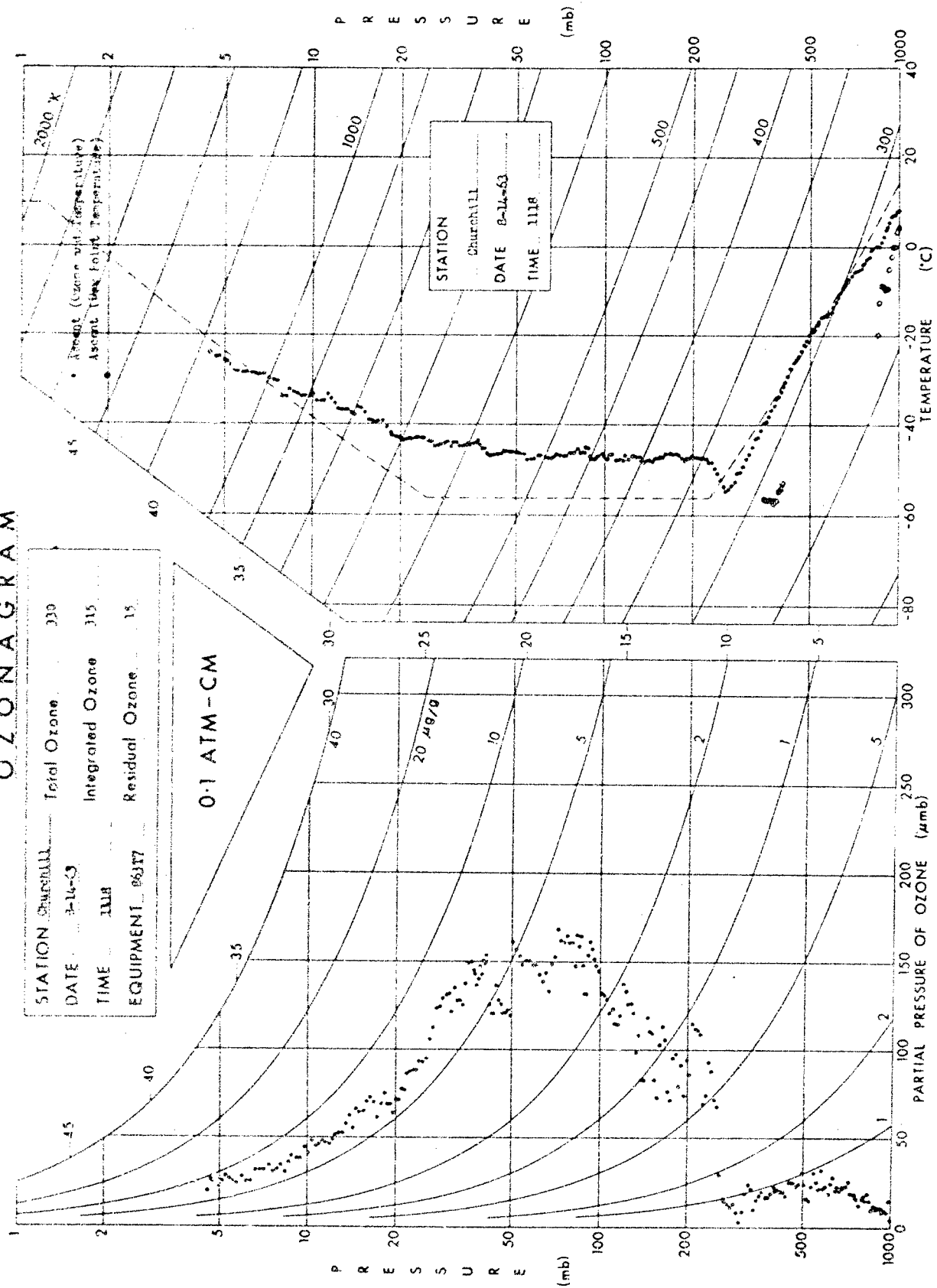
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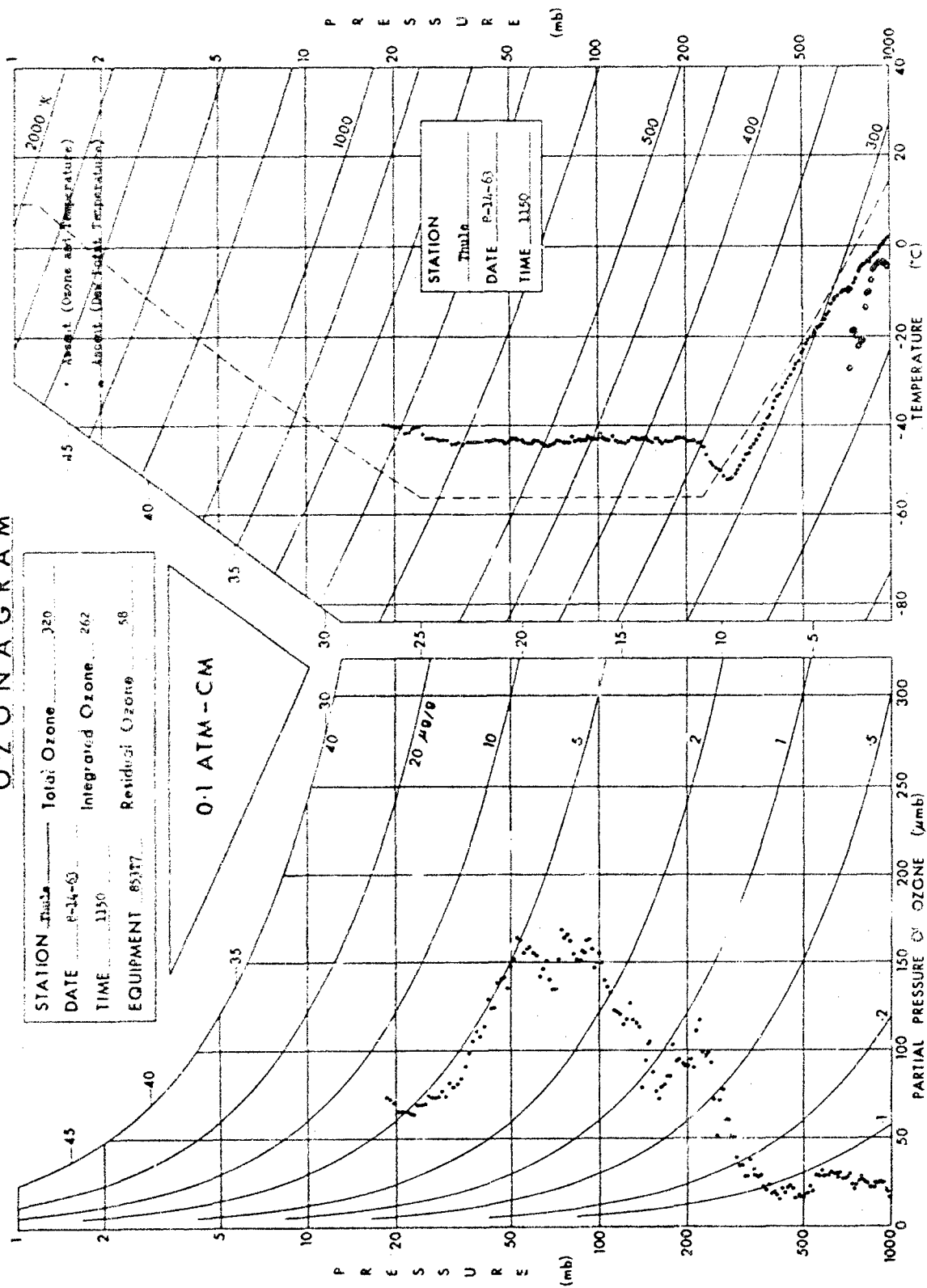
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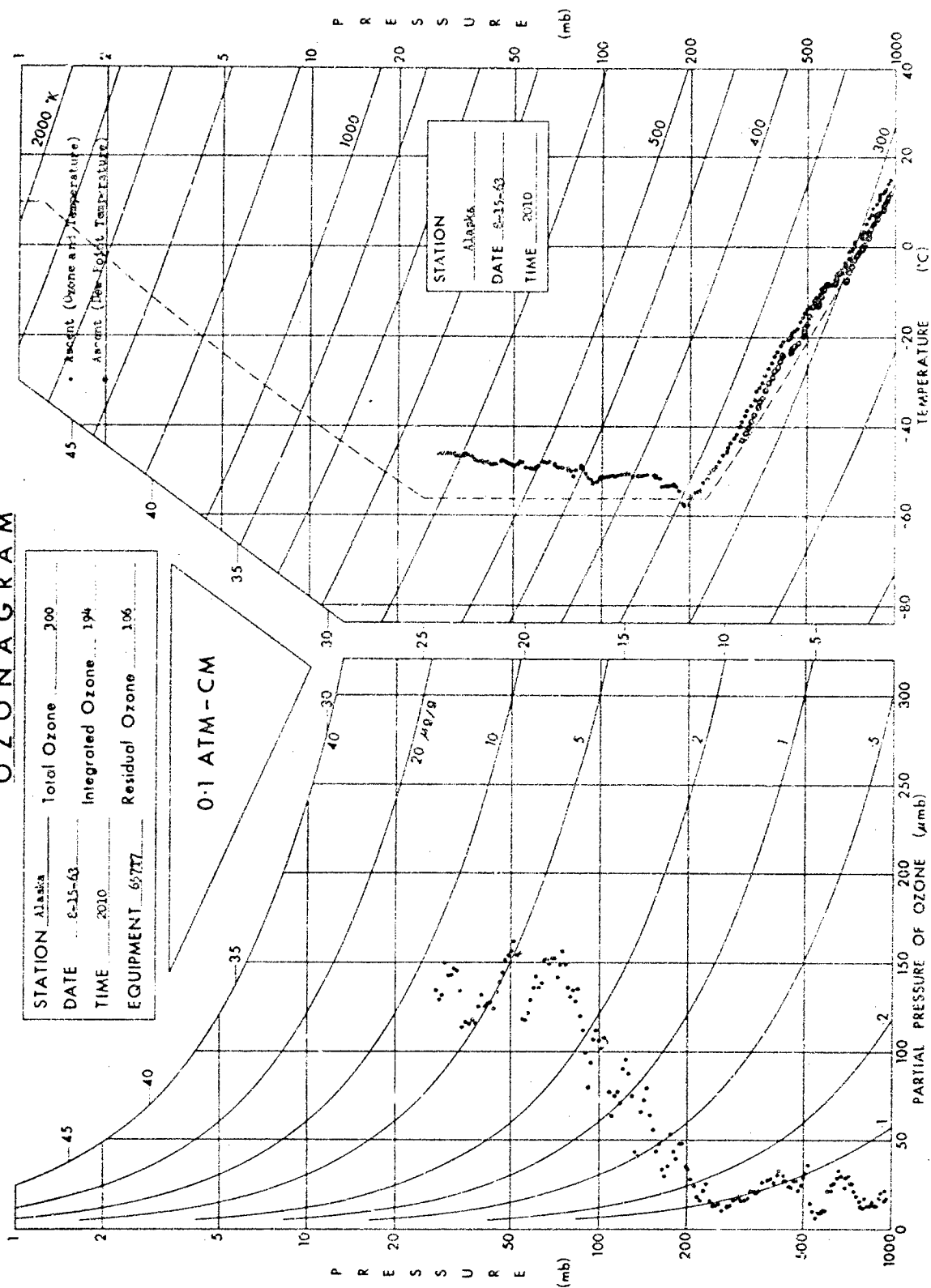
## OZONAGRAM



## O Z O N A G R A M

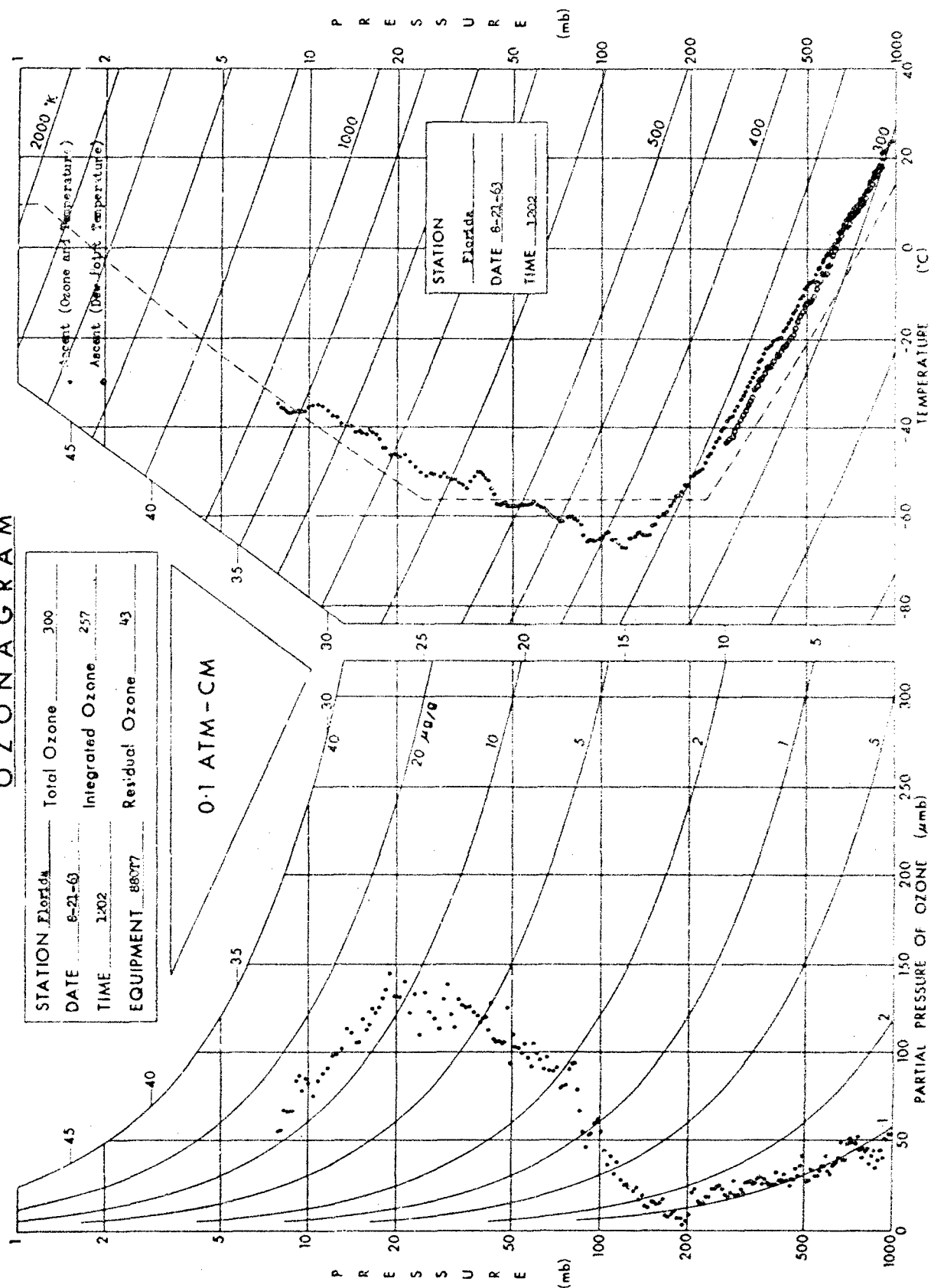


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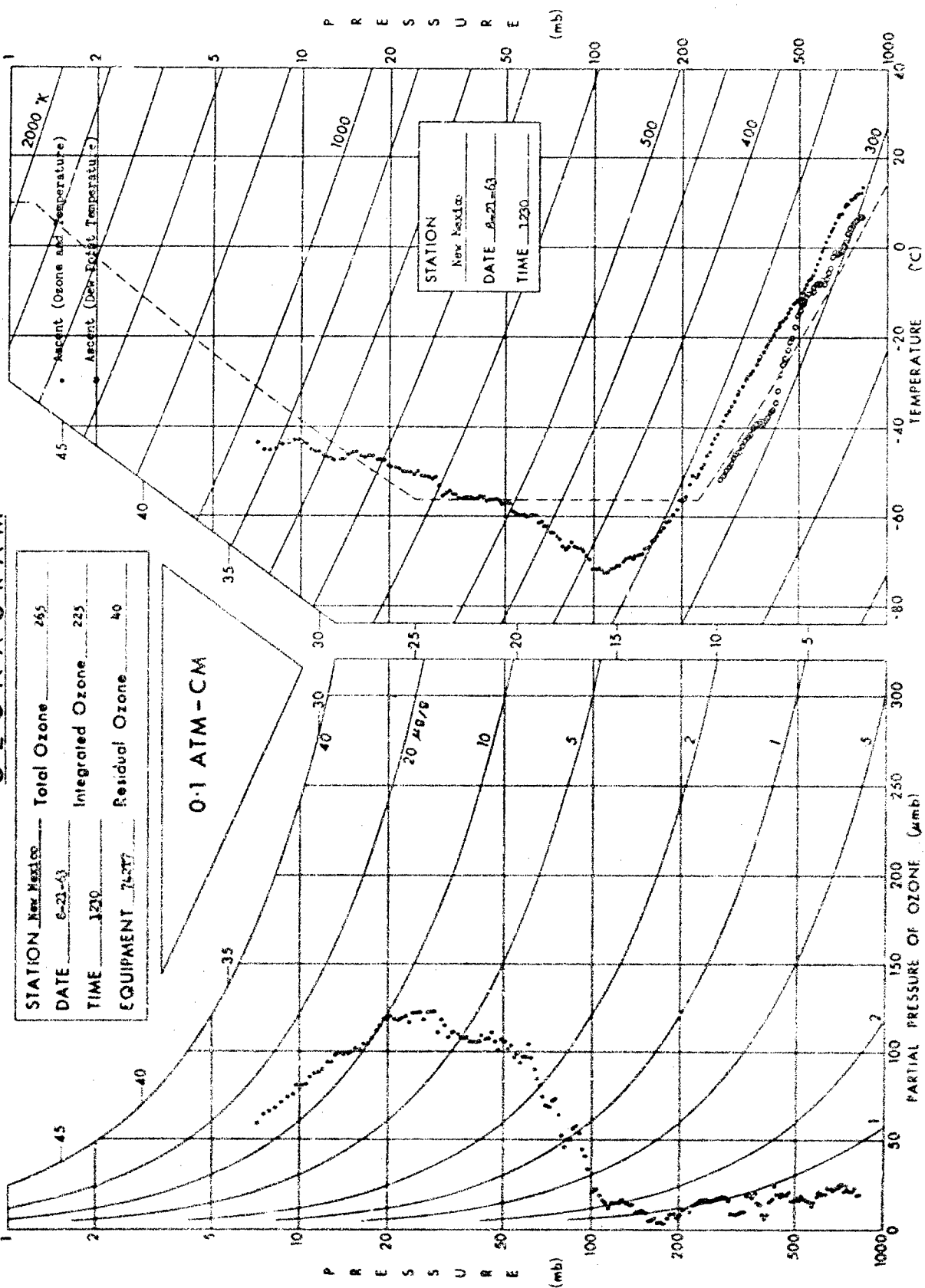




## O Z O N A G R A M



## OZONAGRAM

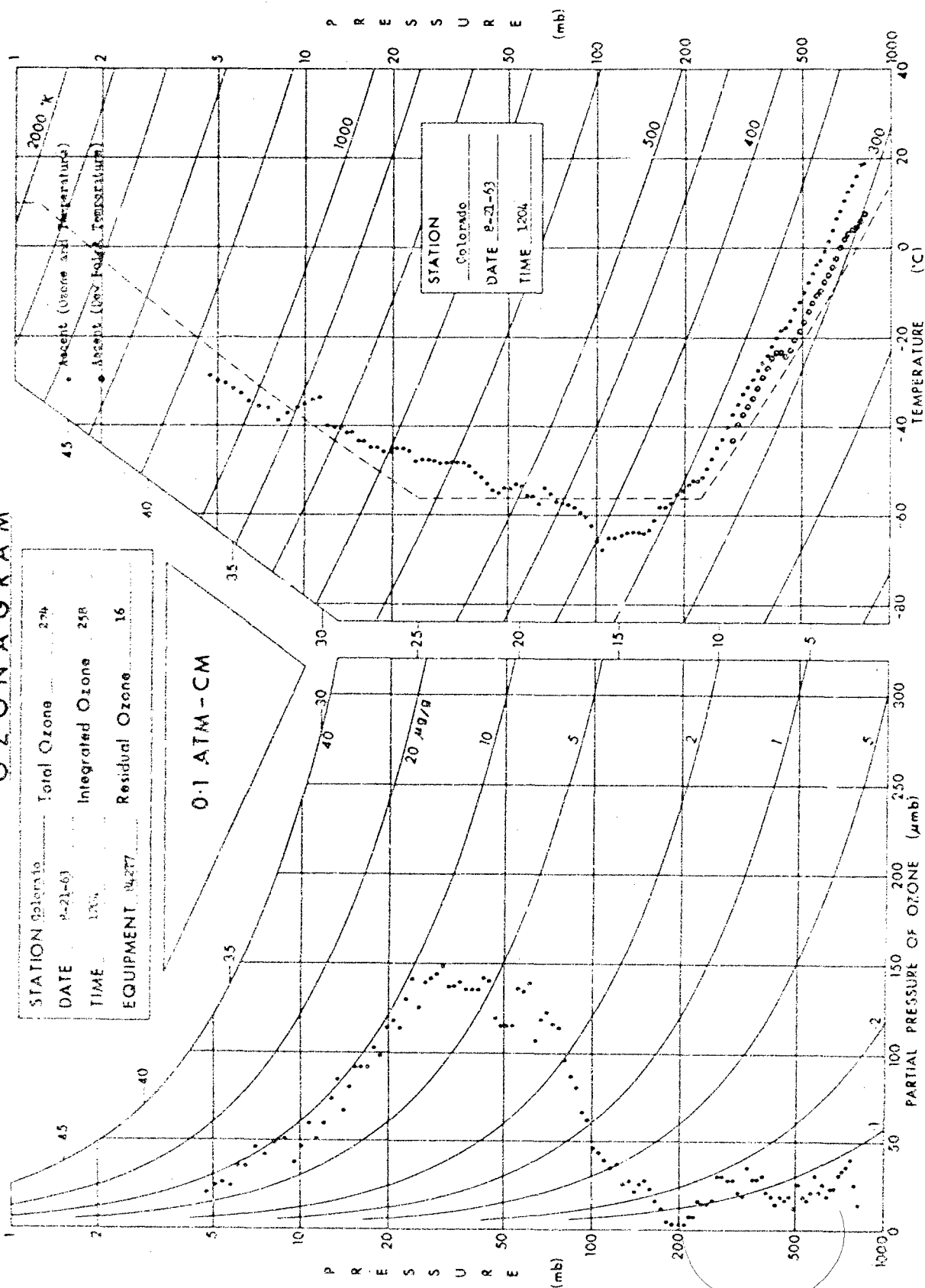


## O Z O N A G R A M

STATION Colorado  
 DATE 8-21-63  
 TIME 1304  
 EQUIPMENT 94277

Total Ozone 274  
 Integrated Ozone 258  
 Residual Ozone 16

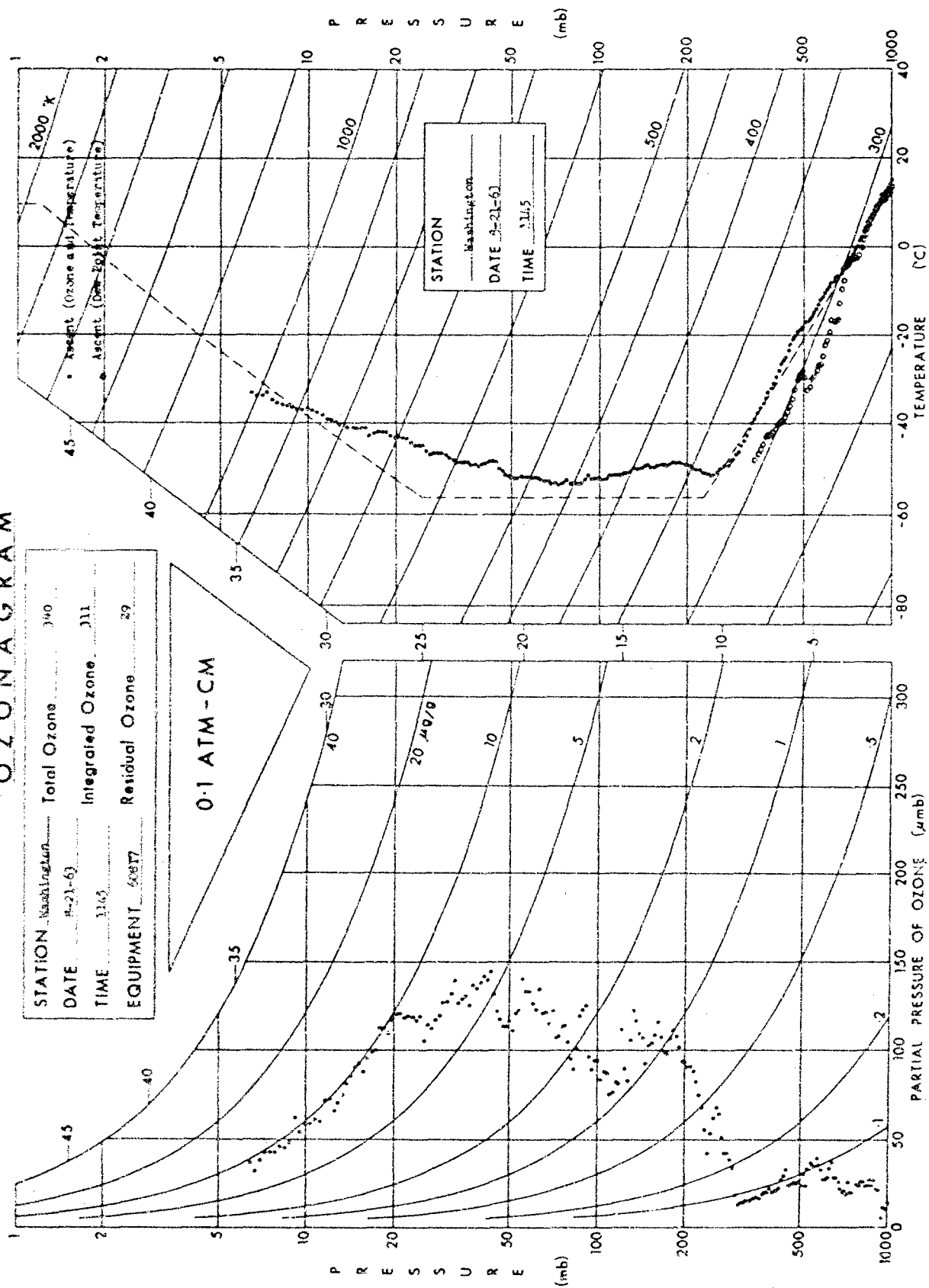
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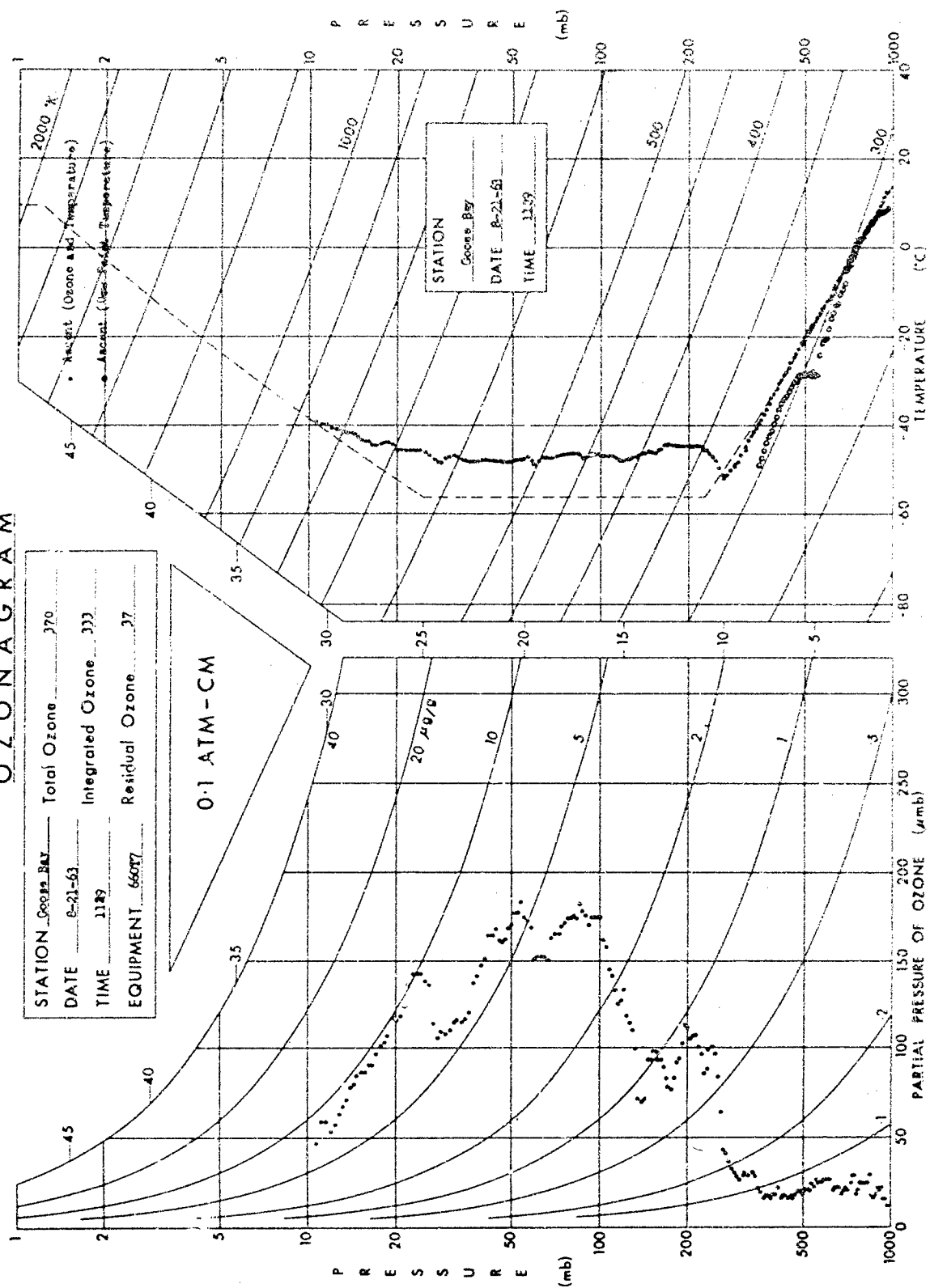
## OZONAGRAM

STATION Washington Total Ozone 340  
 DATE 9-21-63 Integrated Ozone 311  
 TIME 1145 Residual Ozone 29  
 EQUIPMENT 5027

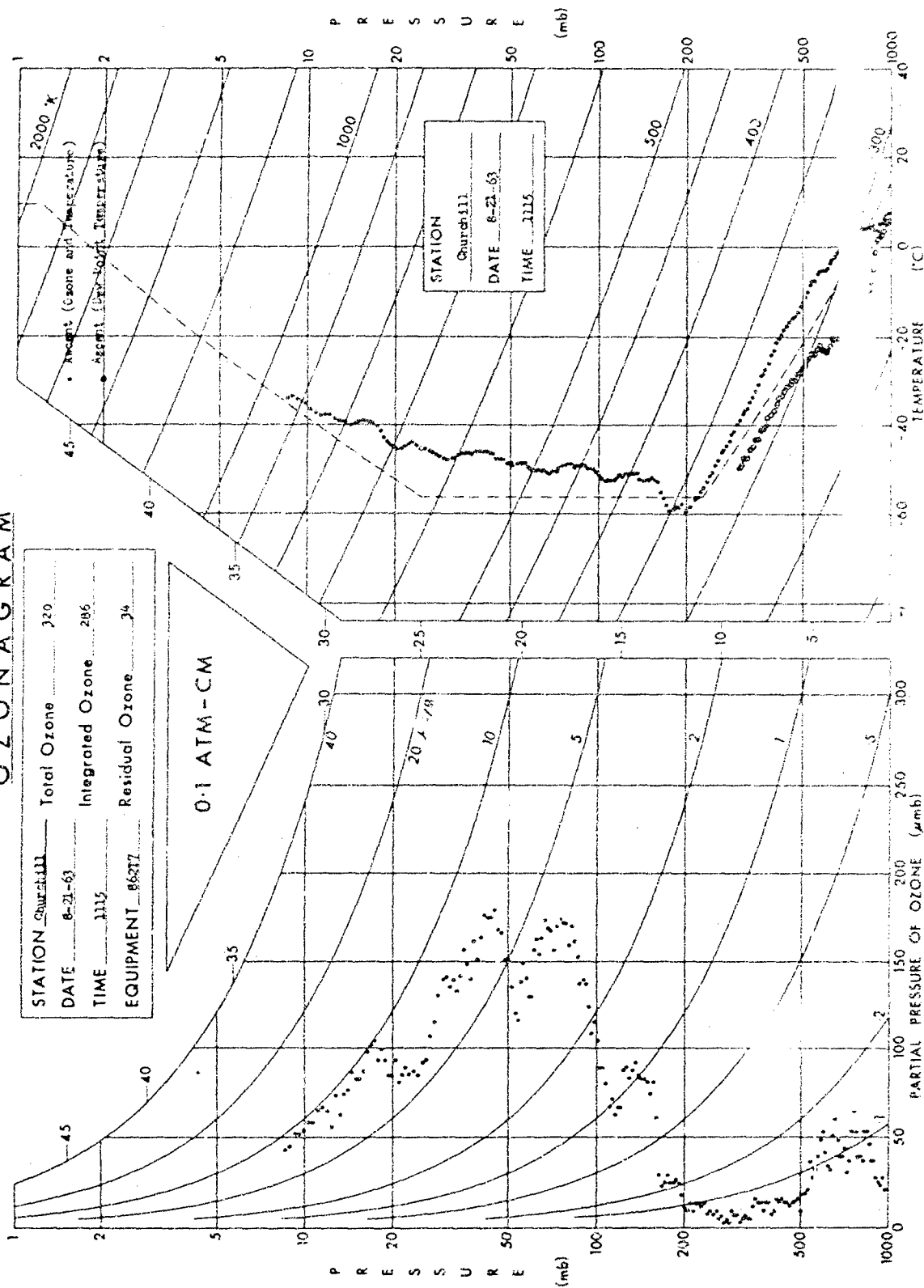
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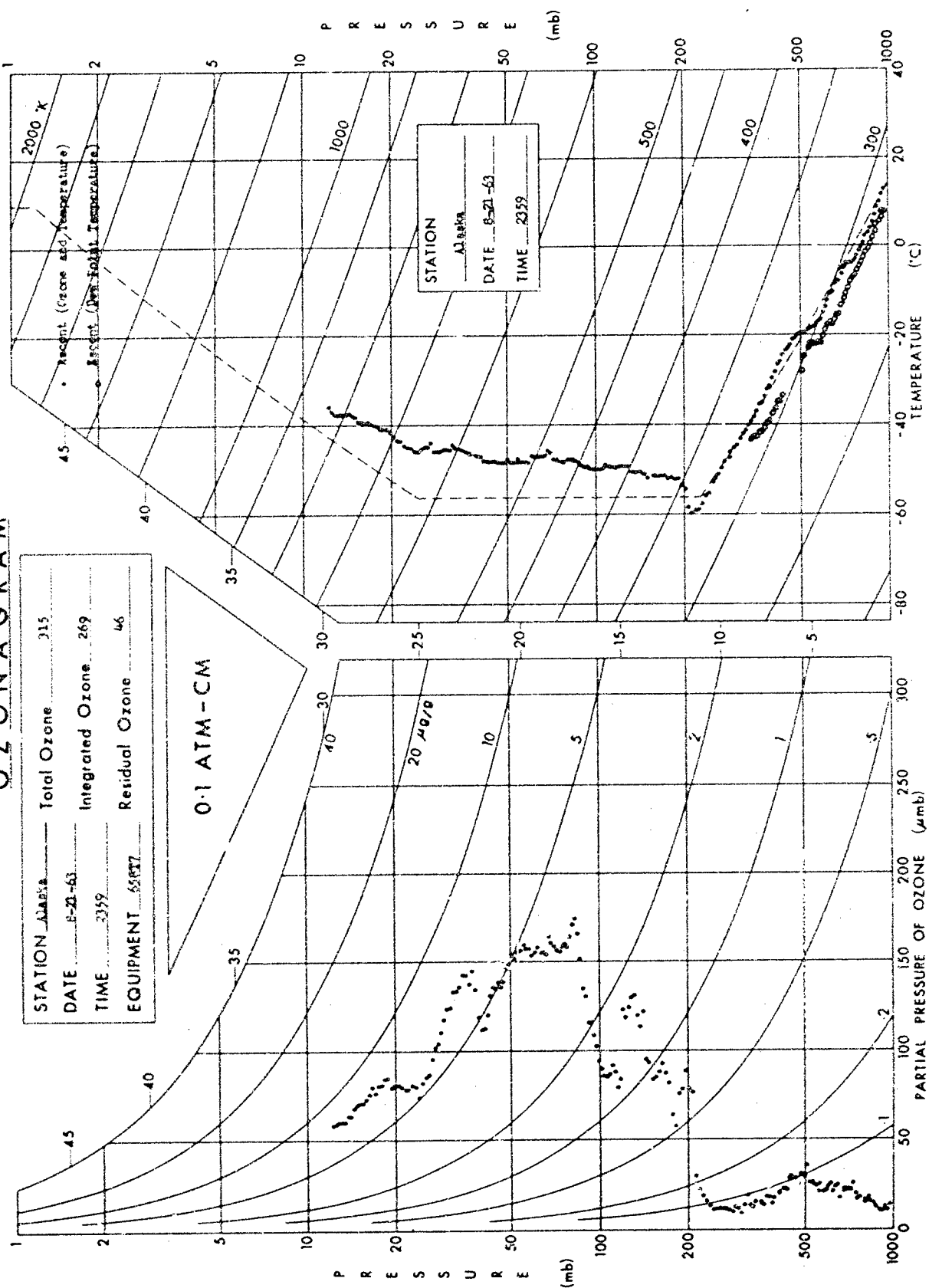
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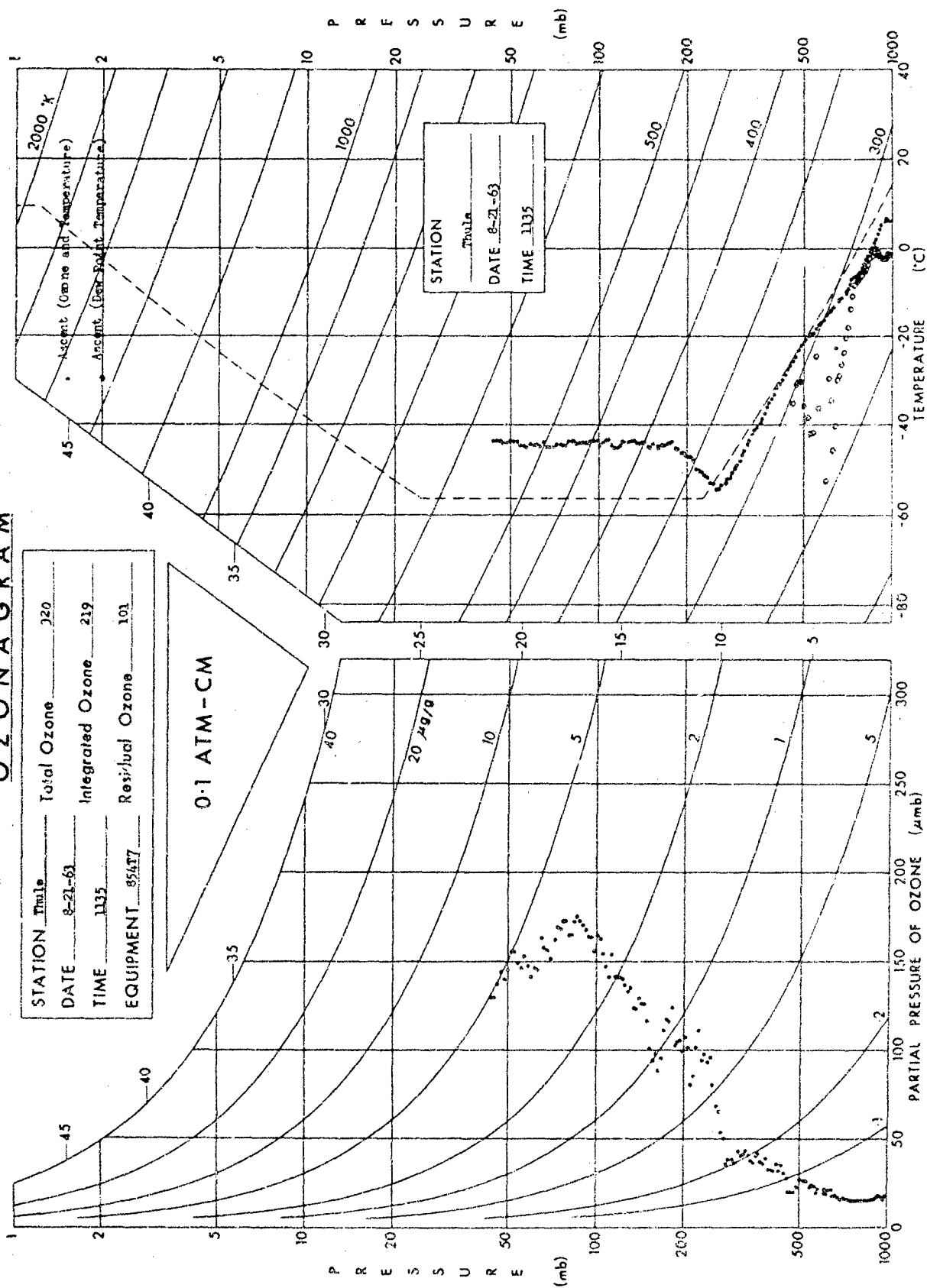
## OZONAGRAM



# OZONAGRAM

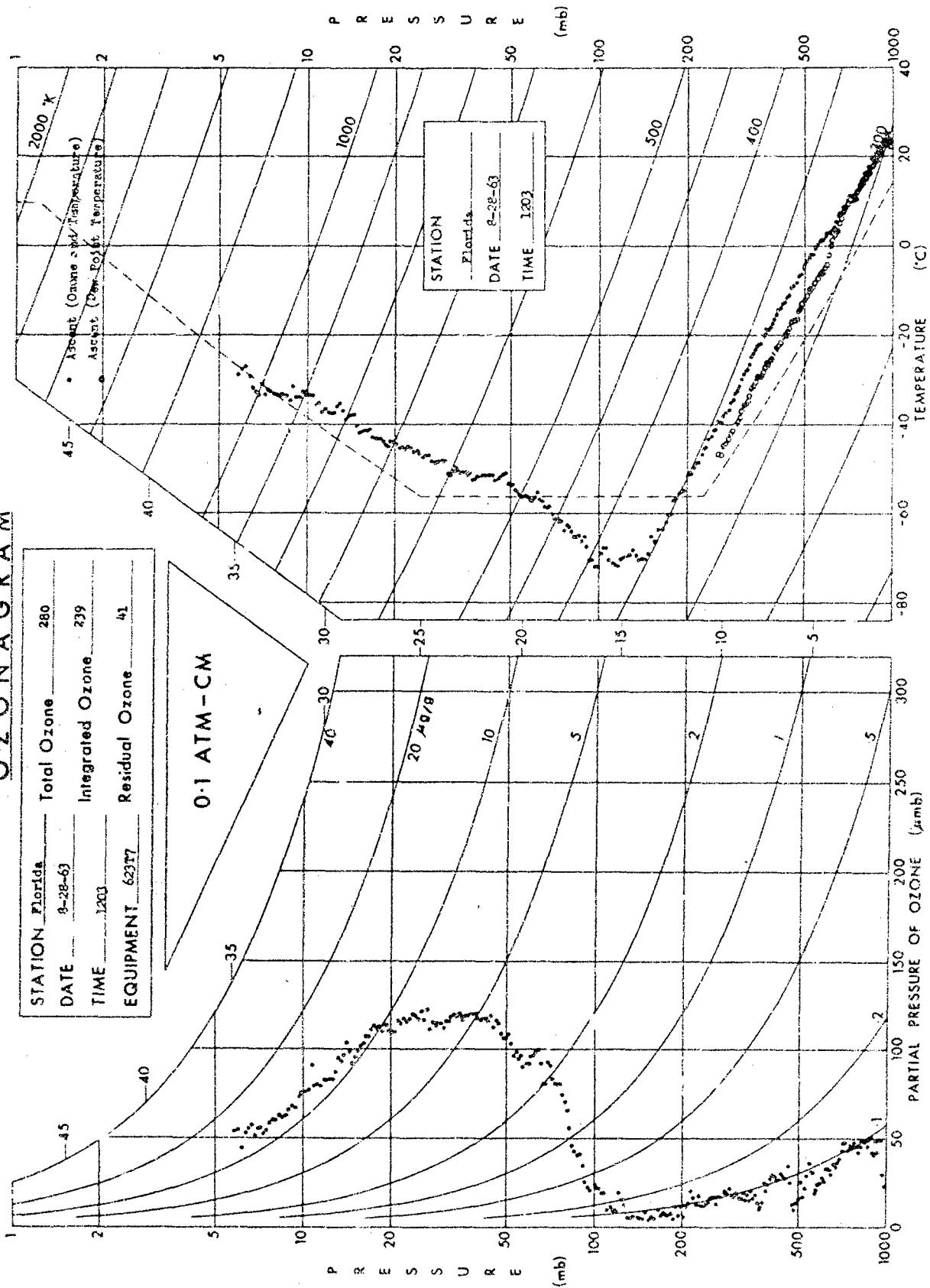


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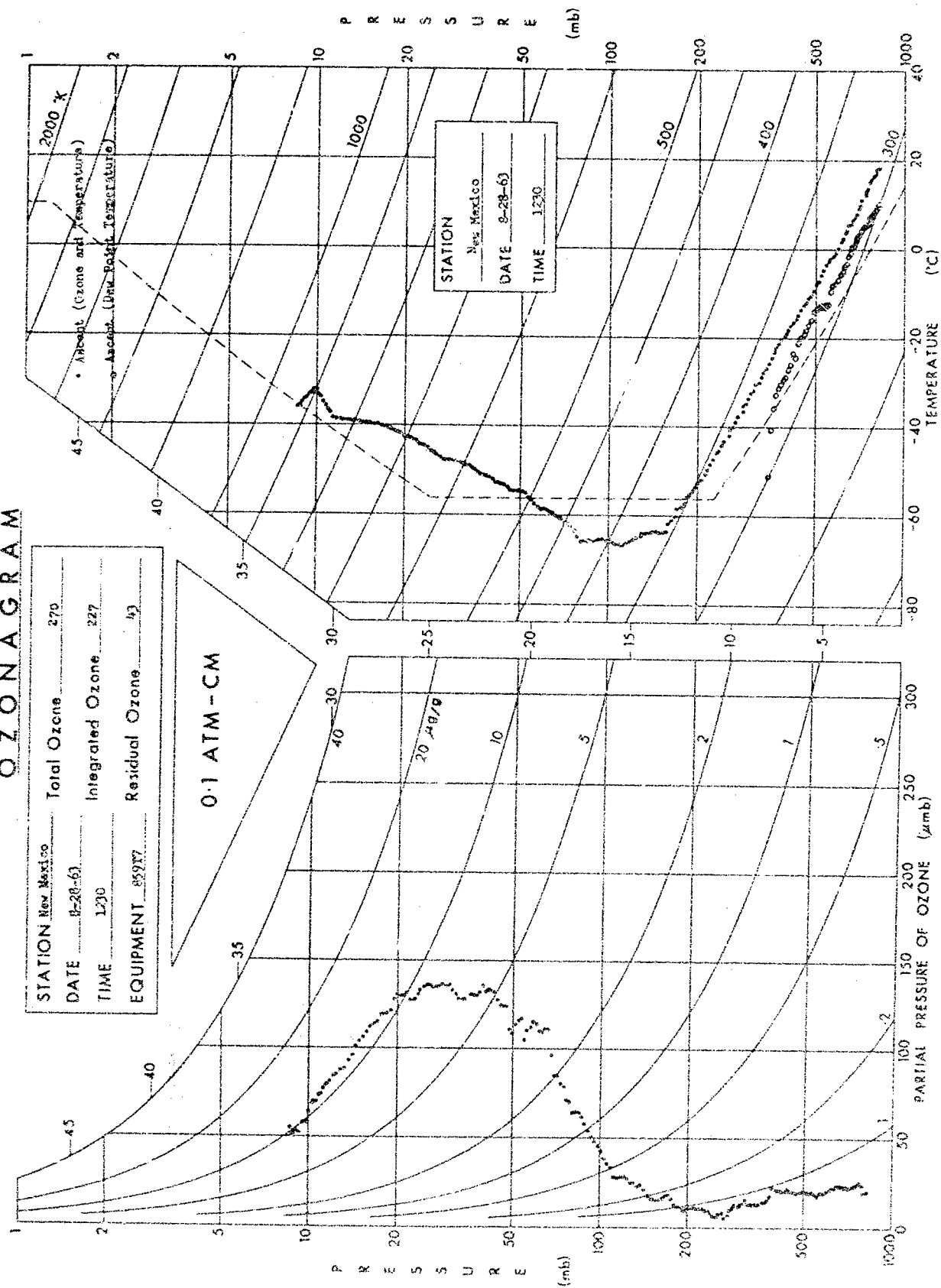
## OZONAGRAM



## O Z O N A G R A M

STATION New Mexico Total Ozone 370  
 DATE 8-28-63 Integrated Ozone 227  
 TIME 1230 Residual Ozone 43  
 EQUIPMENT 85977

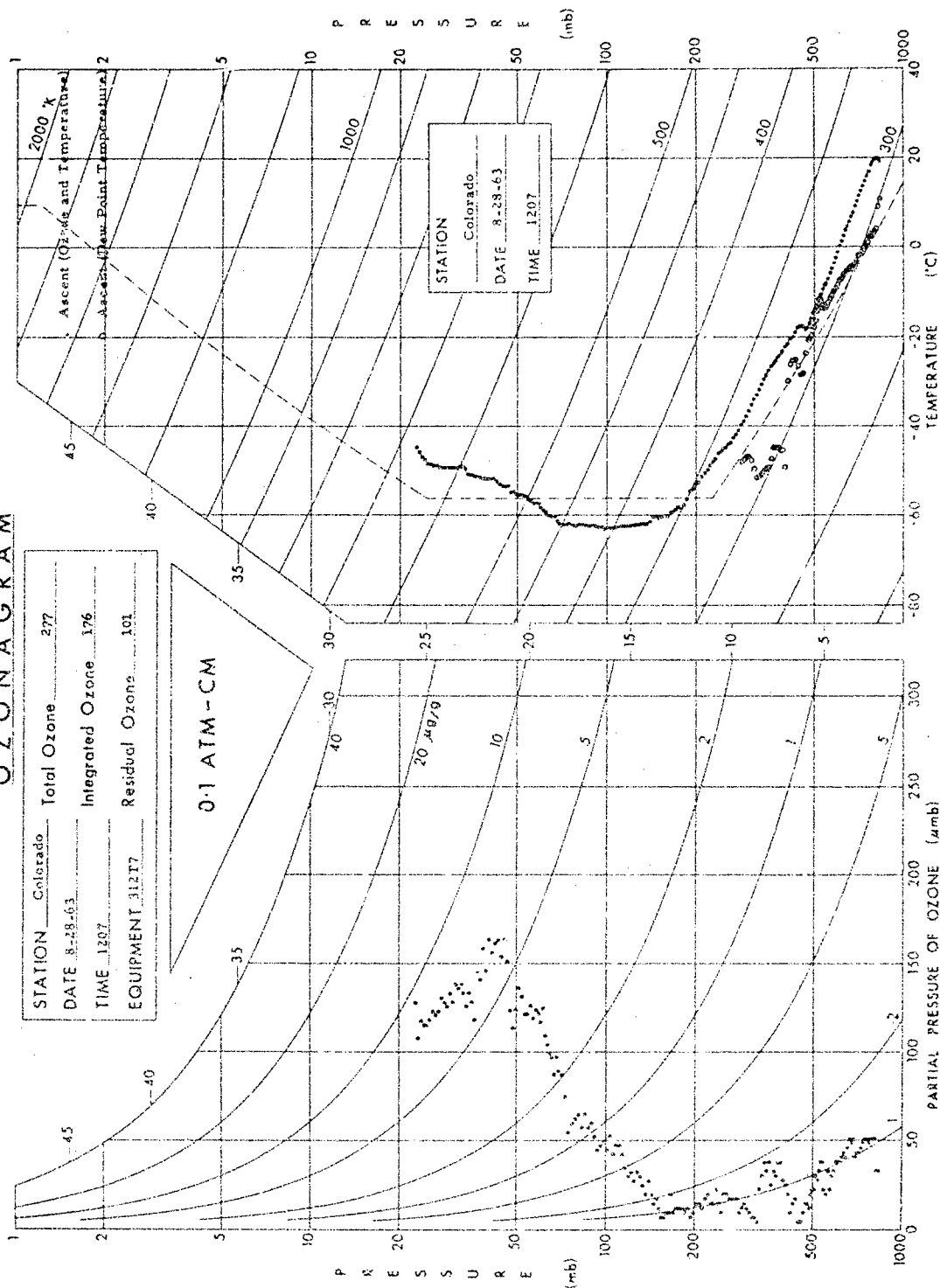
0.1 ATM-CM



## OZONAGRAM

STATION	Colorado	Total Ozone	277
DATE	8-28-63	Integrated Ozone	176
TIME	1207	Residual Ozone	101
EQUIPMENT	312T7		

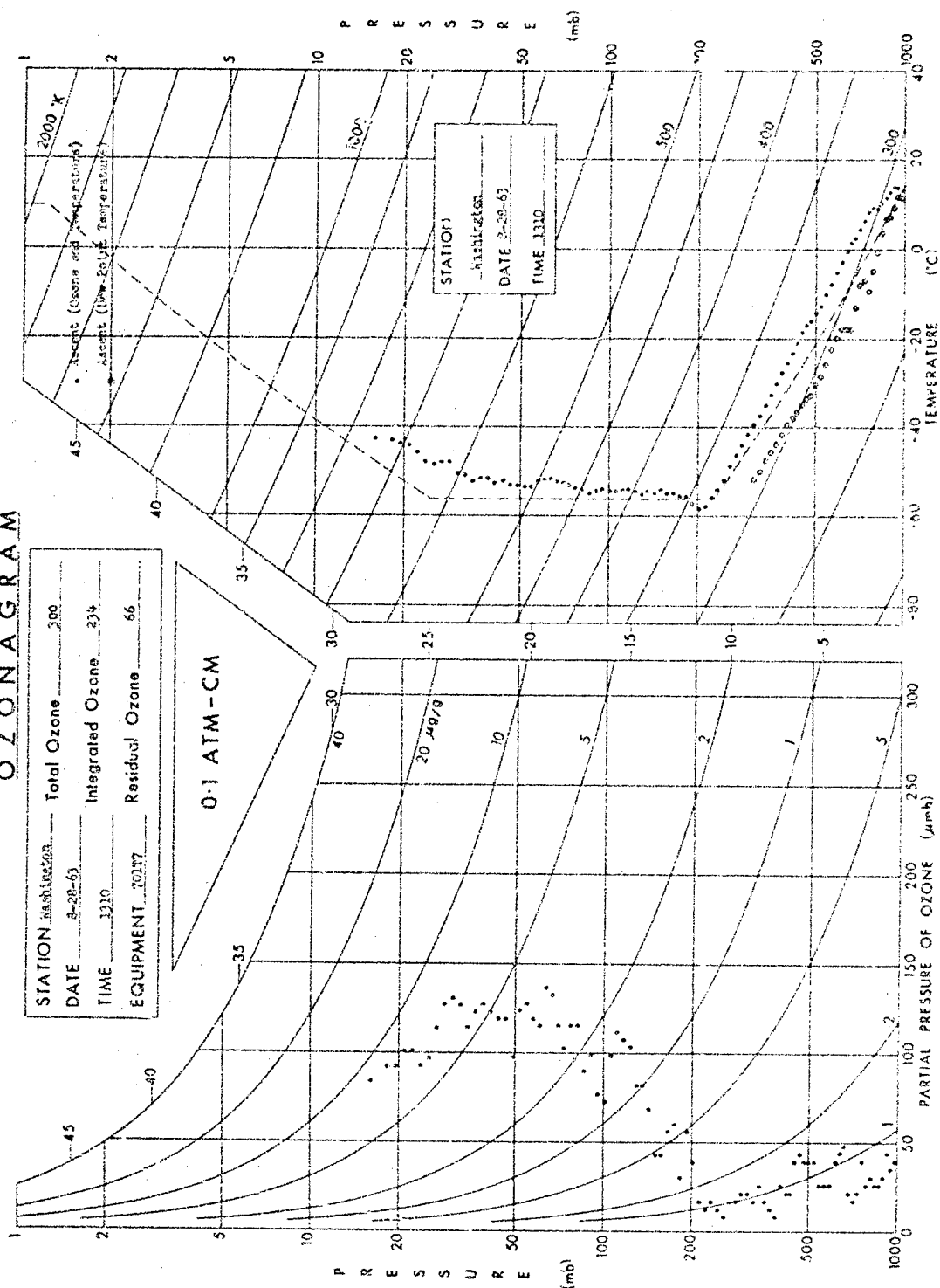
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## OZONAGRAM

STATION Washington Total Ozone 200  
 DATE 8-28-63 Integrated Ozone 234  
 TIME 1310 Residual Ozone 66  
 EQUIPMENT 70117

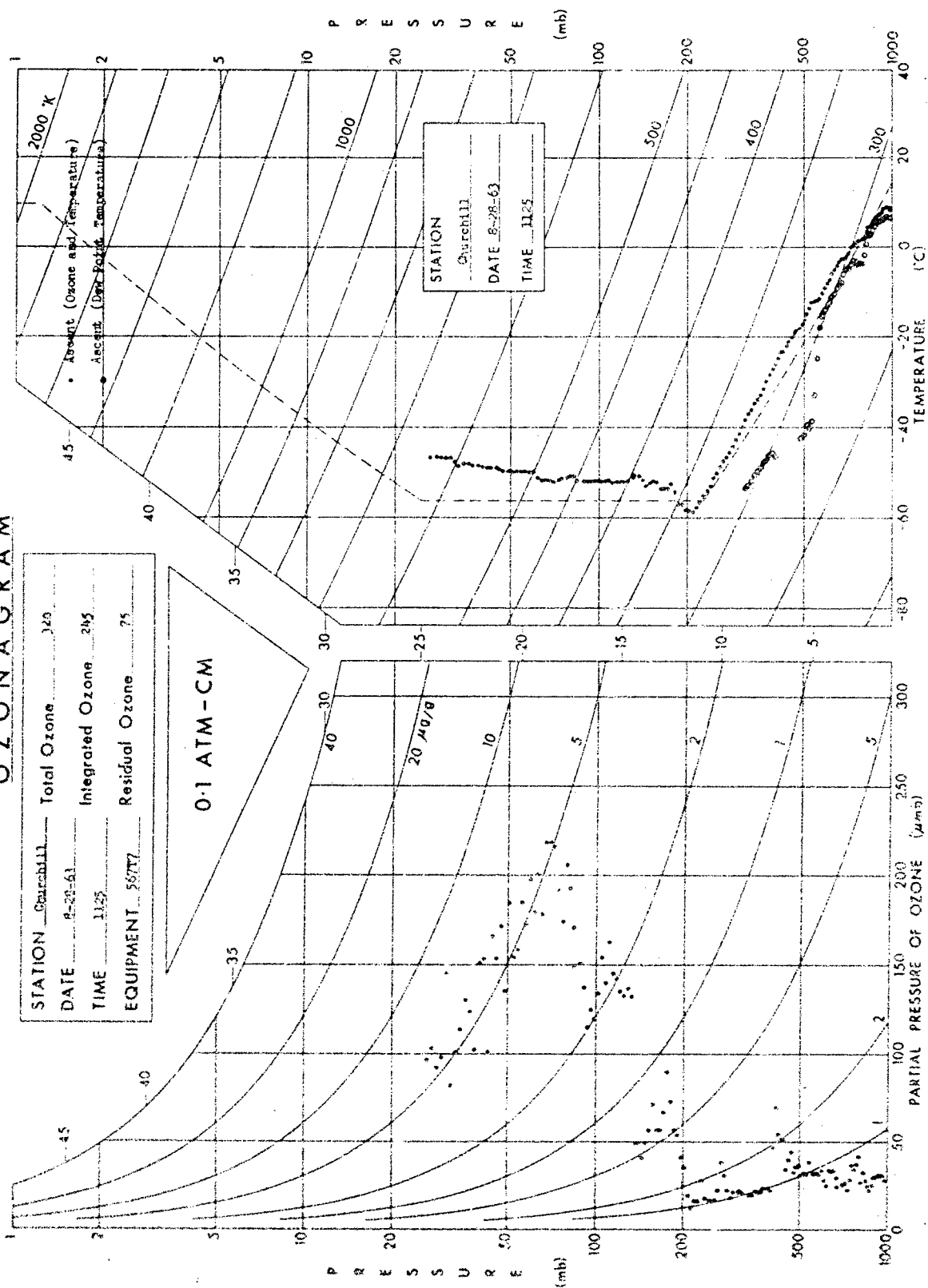
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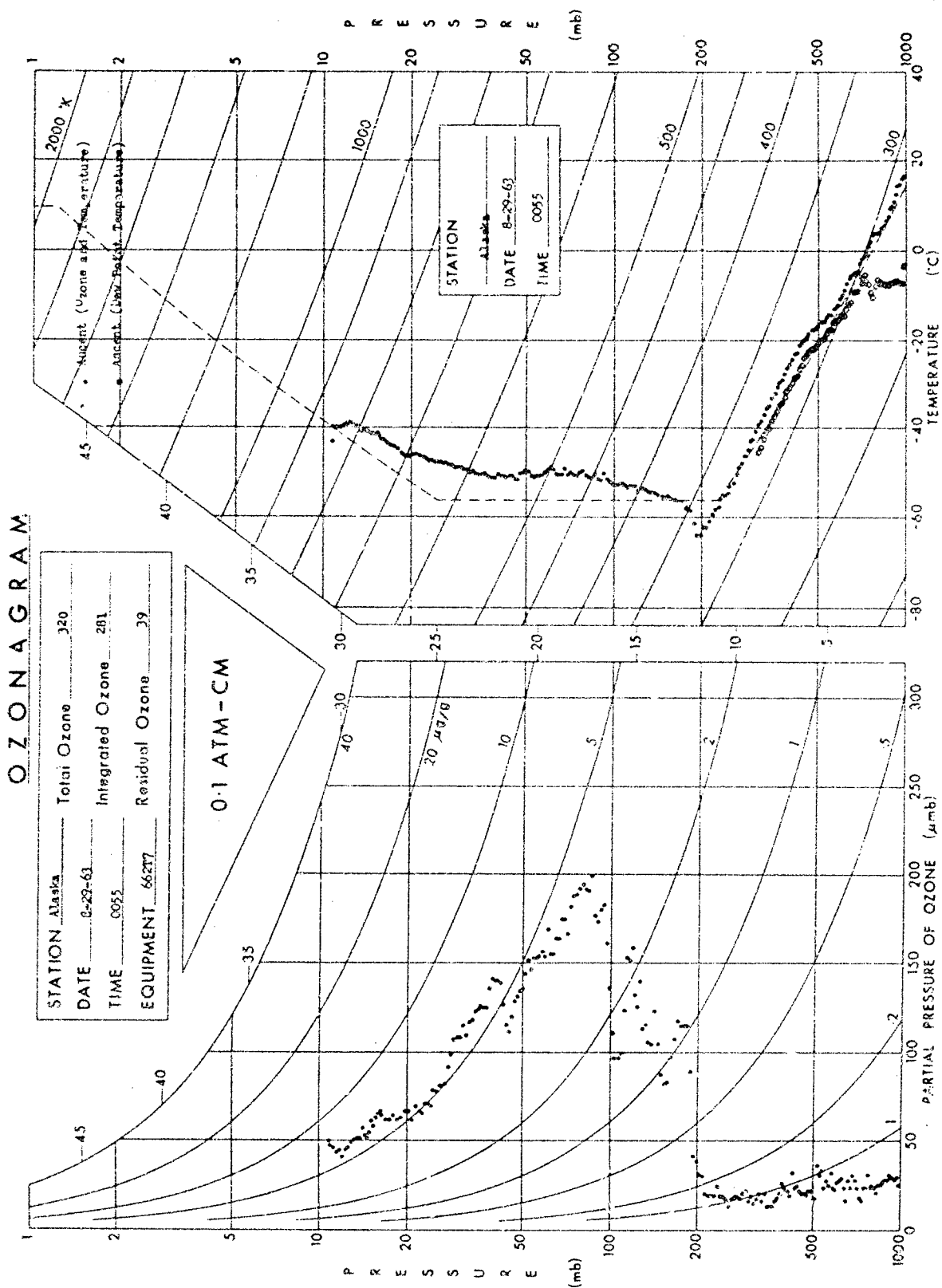


## O Z O N A G R A M

STATION Churchill Total Ozone 320  
 DATE 8-28-63 Integrated Ozone 245  
 TIME 1125 Residual Ozone 75  
 EQUIPMENT 5577

0.1 ATM-CM





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# ENVIRONMENTAL RESEARCH PAPERS

- No. 1. Examination of a Wind Profile Proposed by Swinbank, *Morton L. Barad, March 1964 (REPRINT).*
- No. 2. Wind and Temperature Variations During Development of a Low-Level Jet, *Yutaka Izumi, Morton L. Barad, March 1964 (REPRINT).*
- No. 3. Radiation Pattern of Surface Waves From Point Sources in a Multi-Layered Medium, *N. A. Haskell, March 1964 (REPRINT).*
- No. 4. Photoelectric Emission Phenomena in LiF and KCl in the Extreme Ultraviolet, *R. G. Nazzari, February 1964 (REPRINT).*
- No. 5. Equatorial Loci of the Earth's Magnetic Field and Cosmic Ray Parameters, *E. J. Chernosky, J. M. Collins, M. P. Hagan, March 1964.*
- No. 6. Helium and Argon Emission Continua and Their Use in Absorption Cross-Section Measurements in the Vacuum Ultraviolet, *R. E. Huffman, Y. Tanaka, J. C. Larrabee, March 1964 (REPRINT).*
- No. 7. Airflow and Structure of a Tornadoic Storm, *K. A. Browning, R. J. Donaldson, Jr., March 1964 (REPRINT).*
- No. 8. Automatic Digital Radar Reflectivity Analysis of a Tornadoic Storm, *David Atlas, Keith A. Browning, Ralph J. Donaldson, Jr., Hugh J. Sweeney, March 1964 (REPRINT).*
- No. 9. Indications of a Lunar Synodical Period in the Sunshine Observations for Boston, Massachusetts, and Columbia, Missouri, *Iver A. Lund, March 1964.*
- No. 10. A Search for Rainfall Calendaricities, *Glenn W. Brier, Ralph Shapiro, Norman J. MacDonald, March 1964 (REPRINT).*
- No. 11. Lee Wave Clouds Photographed From an Aircraft and a Satellite, *John H. Conover, April 1964 (REPRINT).*
- No. 12. Diurnal Variation of the Atmosphere Around 190 Kilometers Derived From Solar Extreme Ultraviolet Absorption Measurements, *L. A. Hall, W. Schweizer, H. E. Hinteregger, April 1964 (REPRINT).*
- No. 13. Absorption Coefficients of Oxygen in the 1060-580-A Wavelength Region, *R. E. Huffman, J. C. Larrabee, and Y. Tanaka, May 1964 (REPRINT).*
- No. 14. Sunrise Effects on East-West Ionospheric Propagation Paths, *Thomas D. Conley and David Blood, May 1964.*
- No. 15. Project Firefly 1962-1963, *N.W. Rosenberg, Ed., May 1964.*
- No. 15. (Appendix), Project Firefly 1962-1963—Classified Appendix (U), *N.W. Rosenberg, Ed., June 1964.*
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